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MEANING

MECHANISM AND VITALISM

METAPHYSICS

Key to Pronunciation

ā	ale, fate	ŏŏ	foot, book
ā	chaotic, duplicate	ou	out, devour
â	care	oi	oil, soil, avoid
ă	add, fat, account	ū	use, cube
ä	arm, father	ů	unite, formulate
à	ask, sofa	û	urn, concur
ē	eve, we	ŭ	up, but, circus
ē	here, deer	ü	menu
ė	event, befall	\mathbf{c} h	chair, much
ĕ	end, bed, silent	g	go, begin
ē	maker, perform	ng	sing
ī	ice, file	th	then, smooth
ĭ	ill, him, charity	t h	thin, worth
ō	old, note	ţů	nature
	obey, anatomy	ďΰ	verdure
ô	orb, corn	y	yet, beyond
ŏ	odd, not, connect	zh =	z in azure
ŏ	soft, cloth	ĸ =	ch in Ger. ich, ach
ōō	food, tool	N =	Fr. bon

^{&#}x27; (primary accent) to indicate principal syllablic stress





the thirteenth letter of the English and most of the other West European languages, is one of the four liquids, or semivowels; it is also classed as a labio-nasal, its sound being produced when with lips closed and the whole uvula lowered the breath makes a humming noise as it issues through the nostrils. The lips play the same part in the pronunciation of m as in that of b, but in pronouncing b the nasal passage has no part. Hence when that passage is obstructed or closed the sound produced is that of b not of m.

The M as a capital letter has the same form in the Greek and the Latin alphabets and in all the alphabets derived from them, and in all those alphabets generally the same sound value

In English there are a few words of Greek origin, mostly technical, in which mn begins a syllable or a word in such cases the m is silent,

for example, mnemonic, nemonic.

In many words derived from other languages the m of the original word is changed to n in English, examples Comitatus (Lat) county, or contrariwise n is changed to m; Anglo-Saxon henep becomes hemp Often p is added after m to give that letter greater distinctness, for example, exemtus, exemptus, unkemmed, unkempt

M. QUAD. See Lewis, Charles Bertrand MAARTENS, Maarten, mar'tén marténz, pseudonym of the Dutch author, Joost Marius Willem van der Poorten Schwarz: b Amsterdam, 15 Aug 1858; d. Zeist, Holland, 4 Aug 1915 He passed his early life in England; was educated in Germany and at the University of Utrecht, was admitted a barrister but chose literature as a profession, and in 1890 published his first work, 'The Sin of Joost Avelingh,' which at once arrested the attention alike of critics and of the reading public. This, like all his volumes, was written at first hand in English, not, as has been sometimes supposed, translated from Dutch MS. Maartens thus presented the curious instance of an author electing to address wholly a foreign public. Indeed it was only with reluctance, to safeguard himself against unsatisfactory translations, that he consented to the publication of his books in Dutch.

MAASIN, ma-ä'sĭn, Philippines, (1) a pueblo of the province of Leyte, island of Visayas, situated on the extreme southwestern coast, 75 miles southwest of Tacloban. It is a handsome, well-built city, and has a large trade, mostly in hemp Pop 22,000; (2) a town of the province of Iloilo, Panay, on a tributary of

the Sague branch of the Jalaur River, 18 miles northwest of Iloilo. Pop 9,700.

MAASS, Otto, Canadian chemist. b. New York, N. Y., 8 July 1890 After a course at the Montreal High School, he studied at McGill, Berlin, and Harvard universities. In 1917 he became professor in charge of physical chemistry at McGill and in 1923 was named Macdonald professor of physical chemistry there. He became chairman of the department of chemistry at McGill in 1937. He is also director and consulting physical chemist of the Canadian Pulp and Paper Research Institute In 1940-41 he was president of Section III of the Royal Society of Canada He has published (Introduction to Physical Chemistry) (1931, rev ed. 1939), and papers dealing with pulp and paper, physical chemistry, etc.

MAASTRICHT. See MAESTRICHT.

MAAT, or MA'T, in ancient Egypt, the goddess of truth and justice. She is said to have guided the souls of the dead to Osiris (qv.)

MAB, the fairy queen of Connaught and a familiar name in Celtic folklore Mab has been celebrated by Shakespeare and other English poets. The name is of uncertain origin, being variously derived from the Midgard of the Eddas, the Habundia or Dame Abonde of Norman fairy lore, and from the Cymric mab, a child According to Voss, Mab was not the fairy queen, the same as Titania, this dignity having been ascribed to her only by mistaking the use of the old English word queen, which originally meant only a woman Queen Mab is mentioned in Shakespeare's 'Romeo and Juliet,' Ben Jonson's 'Satyr,' Randolph's pastoral of 'Amyntas,' Drayton's 'Nymphidia' and Milton's 'L'Allegro'

MABÁLACAT, mä-bä-la'kät, a pueblo of the province of Pampanga, Luzon, 16 miles north of Bacolor, the provincial capital It is on the main road, and on the Manila and Dagupan Railroad. Pop. 10,600.

MABERY, mā'bèr-ĭ, Charles Frederic, American chemist: b North Gorham, Me, 13 Jan. 1850; d. 26 June 1927. He was graduated at the Lawrence Scientific School, in 1876, and was assistant instructor in chemistry there from 1875 to 1883, when he became professor of chemistry in the Case School of Applied Science, serving until 1911; emeritus professor thereafter. In the investigation of the composition of American petroleum his work brought him into special prominence. He also

did valuable work in connection with electric smelting. The results of his original investigations since 1876 were published in the Proceedings of the American Academy of Arts and Sciences and in various chemical journals at home and abroad.

MABIE, Hamilton Wright, American editor, critic and essayist: b. Cold Spring, N. Y., 13 Dec. 1846, d. Summit, N. J., 31 Dec. 1916. He was graduated at Williams College in 1867 and from the Columbia University Law School in 1869. He joined the staff of the Christian Umon (now the Outlook) in 1879 and later became associate editor. He was a member of the American Academy of Arts and Letters and received honorary degrees from Williams, Union, Western Reserve and Washington and Lee universities. In his lectures and papers he constantly advocated the reading of good books, and his own works on literature, etc., have done much to cultivate a good taste in the American reading public. Among others he published 'Norse Stories Retold from the Eddas' (1882); 'Nature in New England' (1890); 'My Study Fire,' first series (1890); 'Short Studies in Literature' (1891); 'Under the Trees and Elsewhere' (1891); 'Essays in Literary Interpretation' (1892); 'My Study Fire,' Books and Culture' (1897); 'Work and Culture' (1898); 'The Life of the Spirit' (1889); 'William Shakespeare—Poet, Dramatist and Man' (1900); 'Works and Days' (1902); 'Parables of Life' (1902); 'Backgrounds of Literature' (1903); 'Myths Every Child Should Know' (1905); 'Fairy Tales Every Child Should Know' (1905); 'The Great Word' (1906); 'Christmas To-day' (1908); 'Introductions to Notable Poems' (1909); 'American Ideals, Character and Life' (1913); 'Japan, To-day and To-morrow' (1914).

MABILLEAU, Léopold, French economist: b. Beaulieu (Indre et Loire), 1853; d La Boule, 16 Feb. 1941. After teaching in a number of institutions he became in 1906 professor at the National Conservatory of Arts. He held many positions connected with the improvement of social conditions and lectured in the United States on social and economic questions. Mabilleau was made an officer of the Legion of Honor and a number of his works were crowned by the Academy of Moral and Political Sciences. He edited the works of several authors, contributed to French magazines and published 'Victor Hugo' (Paris 1893; 5th ed., 1911), 'Histoire de la philosophie atomistique' (1895); 'La prévoyance sociale en Italie' (1898); 'La cooperation en France' (1900); 'La mutualité francaise, doctrine et applications' (1904); 'Notions élémentaires d'instruction civique de droit usuel et d'économie politique' (1912). The latter was in collaboration with E. Levasseur and E. Delacourtie.

MABILLON, Jean, zhon mā-bē-yon, French ecclesiastic and author: b. Saint Pierre du Mont, Champagne, 23 Nov. 1632; d Paris, 27 Dec. 1707. Having joined the Benedictines of Saint Maur, he was chosen to assist Dom Jean d'Achery in the compilation of his 'Spicilegium Veterum Scriptorum,' and subsequently edited the works of Saint Bernard (1690) in

the series of the fathers published by his congregation In 1683 he was sent to Germany by Louis XIV to collect documents relating to French history; and the applause with which his 'Iter Germanicum,' a narrative of the journey, was received, induced the king to send him to Italy in 1685 to make purchases for the royal, library A result of this tour was his 'Musæum Italicum' (1687-89), a work of great value. Later he was selected by his superiors to refute Rancé, abbot of La Trappe, who had condemned the custom of permitting monks to study. IIIs 'Essay on Monastic Studies,' which appeared in consequence in 1691, was equally remarkable for sound argument and good tem-'Vetera Analecta' (1675–85); 'De Re Duplomatica' (1681); and 'De Liturgia Gallicana' (1685). He edited and published with Ruinart 'Acta Sanctorum Ordinis Sancti Benedicti' (1668–1702) and prepared the first four volumes of the (Appales Ordinis Sancti Benedicti') umes of the 'Annales Ordinis Sancti Benedictini' (1703-39). A collection of his 'Ouvrages posthumes' appeared in 1724, and his 'Inedited Correspondence with Montfaucon, Maghabecchi, etc.,' was edited by Valery (1847). Consult Baackner, A., 'Mabillions Reise durch Bayern im Jahre 1683' (Munich 1910); Denis, P., 'Dom Mabillon en sa Méthode historique' (Paris 1910).

MABINI, ma-bē'nē, Apollinario, Filipino insurgent: d. Philippine Islands, 1903 He was educated in the Catholic College of Manula, entered the public service under Spanish rule, became advocate of the treasury, resigned in 1896, and entered the insurrection. He was imprisoned for nine months by the Spaniards and then associated himself with Aguinaldo, Rizal and Agonchillo. Although a sufferer from paralysis he was the soul of the revolutionary movement and by many is considered the ablest man produced in the revolution. He became privy councillor of Aguinaldo and for a time was Minister of Foreign Affairs and chief of the Supreme Court in the latter's so-called government. In 1899 he surrendered to the United States, was sent into exile, but allowed to return in 1903 when he took the oath of allegiance. He was the brains of the Malolos government but opposed the Malolos constitution because he believed that the Islands needed a strong centralized government and also because it did not provide for a separation of Church and State. He was of the Tagalog tribe. Consult Worcester, Dean C., 'The Philippines, Past and Present' (2 vols., New York 1914) and Philippine Insurrection Records in the Archives of the War Department, Washington,

MABINOGION, mab-i-no'gi-on, The, the name generally but incorrectly applied to all mediæval Welsh stories. Of the general title 'Mabinogion,' which Lady Charlotte Guest's English version (1838-49) has made familiar, John Rhys gives an explanation "An idea prevails," says Principal Rhys, "that any Welsh tale of respectable antiquity may be called a mabinogi; but there is no warrant for extending the use of the term . . . For, strictly speaking, the word mabinog is a technical term belonging to the bardic system, and it means a literary apprentice. In other words, a mabinog was a young man who had not yet acquired the art of

making verse, but who received instruction from a qualified bard. The inference is that the 'Mabinogion' meant the collection of things which formed the mabinog's literary training — his stock in trade, so to speak; for he was probably allowed to relate the tales forming the four branches of the Mabinogion, at a fixed price established by law or custom. If he aspired to a place in the hierarchy of letters, he must acquire the poetic art " In Lady Charlotte Guest's later edition in one volume (1877), the most convenient edition for reference,—12 tales in all will be found. Of these, the most natively and characteristically Welsh in character are such tales as the vivid, thrice romantic 'Dream of Rhonabwy,' which owes little to outside sources 'The Lady of the Fountain,' on the other hand, shows in a very striking way the influence of the French chivalric romances that Sir Thomas Malory drew upon so freely in 11s Morte d'Arthur) In the admirably edited Oxford text of the Welsh originals by Rhys and Evans (1887-90), 'The Lady of the Fountain' appears under the title of 'Owain and Lunet'; and Lunet's name at once recalls Tennyson's 'Idylls of the King' The old manuscript volume of the 'Mabinogion,' known as the 'Llyfr Coch o Hergest,'—the 'Red Book of Hergest,'-written in the dialect of South Wales, is in the famous library of Jesus College, Oxford, the one college in the older English universities which has a time-honored connection with Welsh scholarship and Welsh literature. The tales, though in their present form not older than the 12th century, embody traditions that were afloat prior to that date. Consult John, I. B, 'The Mabinogion' (London 1901); and Lloyd, E. J, 'The Mabinogion as Literature' (in the Celtic Review, Edinburgh 1911).

MABLY, Gabriel Bonnot de, ga-brē-ĕl bon-o de ma-blē, French ecclesiastic and pub-licist: b. Grenoble, 14 March 1709; d Paris, 23 April 1785 His family name was Bonnot. Like his younger brother, the philosopher Condillac (q v.), he was destined for the Church, and after studying at the seminary of Saint Sulpice in Paris was ordained subdeacon He showed little liking for theology, and for some time was secretly employed in affairs of state by his relative Cardinal de Tencin, minister of Louis XV, conducting the most difficult negotiations and writing elaborate reports with an ability for which the minister received all the credit. Later he applied himself to literature, and in 1748 published his 'Droit publique de l'Europe,' which achieved a remarkable success. It was followed by 'Observations sur les Grecs' (1749); 'Observations sur les Romains' (1751); 'Entretiens de Phocion' (1753); 'Observations sur l'histoire de France' (1755); 'Principes des négociations' (1757); 'De la manière d'écrire l'histoire' (1773); 'De la législation' (1776); 'De l'Idée de l'histoire' (1778); and 'Principes de morale' (1784). Having been requested by the government of Poland to prepage for them a side of lears he Poland to prepare for them a code of laws, he visited that country in 1771, and published in 1781 a work 'Du Gouvernement de la Pologne.' He was also consulted by the American Congress in 1783 on the preparation of the Constitution, and embodied his views in his 'Observations sur le gouvernement et les Lois des Etats-Unis d'Amérique' (1784). In this work

he foretold the speedy downfall of the United States. He was an idealiser of ancient Rome and was enamored of the socialistic state and the communism of wealth, and from his pessimistic views on modern social organization was known as the "prophet of woe" Consult Guervier, 'L'Abbé Mably, moraliste et politique' (1886); de la Serae, 'Mabylet les physiocrates' (1911)

MABUCHI, ma-boo'chē, Japanese writer and religious teacher: b. 1693; d 1769. He was distinguished as a scholar, and utilized his great learning in the endeavor to purify the native religion, Shinto, from the accretions of Chinese and Buddhist philosophy, etc., whereby he regarded it as having been corrupted. His love and knowledge of antiquity enabled him to present the native faith in its original simplicity, and his teachings were exemplified in his own life. To him modern students are largely indebted for direct access to ancient Japanese poetry. He added greatly to the knowledge of the past. He was the first of the three great scholars (Motoori and Hirata being the others) who dedicated themselves to this work of simplifying the ancient faith of the country.

MABUSE, ma'buz', Jan, Flemish painter: b. Mauberge, Hainault, in 1472; d. Antwerp, 1 Oct 1552. His real name was Jean Gossart (or Gossaert). When he became a member of the Guild of Saint Luke at Antwerp in 1503, he signed the register as Jennyn van Henegouwe (John of Hainault). He signed his early pictures Jennyn Gossart and those of his middle and last period Joannes Malbodius (John of Mauberge). In the register of the Guild of Our Lady at Middleburg he is entered as Jan de Waele (John the Walloon). It is not known from whom he learned his art, but at Antwerp he fell under the influence of Quentin Matoys (15th century). In 1508 Mabuse, as he is familiarly known, went to Rome with his patron, the magnificent Philip of Burgundy, visiting Verona and Florence on the way. He visiting verona and Florence on the way. He stayed in Rome a year and returned to the court of Burgundy in November 1509. He then was employed at the Duke of Burgundy's castle of Zuytburg, painting for Philip. After Philip's death in 1524, he entered the service of Adolphus of Burgundy. When Christian II of Denmark visited the Low Countries he asked Mabuse to paint his dwarfs and in 1528 he requested the artist to design the tomb for his queen, Isabella, in the abbey of Saint Pierre, near Ghent. Mabuse also painted the children of Christian II — John, Dorothy and Christine, which came into the collection of Henry VIII of England. Mabuse also designed and erected the tomb of Philip of Burgundy in the church of Wyck. Van Mander's biography accuses him of habitual drunkenness, but the great works produced by him, as well as their number, prove that he was a hard-working and painstaking artist, perfectly in command of his powers. In 1527 he accompanied Lucas of Leyden on a pleasure trip to Ghent, Mechlin and Antwerp Mabuse seems to have been the first of the Netherland painters to go to Italy. He brought back a new style; and from his time to that of Rubens and Van Dyck it was considered the proper thing for all Flemish painters to go to Italy.

The best specimen of his early and purely Netherland is the famous 'Adoration of the Magi,' long at Castle Howard, England, and purchased by the National Gallery, London, in 1911 for the extraordinary sum of \$192,000. This great picture was painted in 1500 for the abbey of Grammont in eastern Flanders and was sold by the monks in 1605 to the Archduke Ferdinand, who placed it in a private chapel in Brussels. In the 18th century Charles of Lorraine acquired it and at his death in 1775 the picture passed to England. The signature of Jan Gossart appears in golden letters on the band of the crown on the negro king. In this great work there are 30 figures with an architectural background, much in the style of Mem-

ling and Roger van der Weyden

The National Gallery (London) contains five other precious works by Mabuse, including the portrait of Jacqueline of Burgundy; portrait of a man holding his gloves and the portrait of a man with a rosary. Hampton portrait of a man with a rosary. Hampton Court has the 'Three Children of Christian II, King of Denmark'; 'Adam and Eve in Para-dise'; a portrait of 'Holbein'; 'Eleanor of Austria'; and a 'Holy Family' The Louyre has a magnificent portrait of Jean Carondelet, chancellor of Flanders; a 'Virgin and Child'; a portrait of 'Bénédictin'; and 'a man and his wife.' 'Saint Luke painting the Blessed Virgin and Child' formerly in the Blessed Virgin and Child' formerly in the Blessed Virginia Republic Child's Republic Repu gin and Child' formerly in the cathedral of Mechlin but now in that of Prague, painted in 1515, is a fine example of Italianized Netherland art. Another celebrated picture was a large triptych, 'The Descent of the Cross,' painted for Maximilian of Burgundy for the monastery of Our Lady and Saint Nicholas at Middleburg, which perished when that building was burned in 1568. Durer saw it in 1520 and admired it extremely, although he said "the composition was not as good as the execution » Mabuse excelled in portraiture. Occasionally Mabuse turned to mythological subjects, such as (Neptune and Amphitrite) (1516) in the Berlin Museum. His architecture is beautifully drawn and his painting of rich materials—damasks, embroideries and tapestries—is superb. Consult Segard, Achille, 'Mabuse, Jan' (in Les Arts, No. 123, p. 1, with illustrations including 'Adoration of the Magi,' Paris 1912); Weisz, Ernst, 'Jan Gossart' (Freis 1913).

MAC, or MC, a Gaelic prefix, as Mac-Gregor, MacDonald, McKinley, etc It corresponds with von in surnames of Teutonic origin, Fitz in those of Romance origin, or Ap or Ab in Welsh surnames.

MACA, a tribe of people living in the forests of the eastern slope of the Andes in central Ecuador. They live in huts of palm leaves, make pottery, hunt and cultivate yucca, corn and tobacco. The various tribes, not yet classified as to language, frequently war with one another. Their weapons are spears, blowguns and poisoned arrows. They dry the heads of slain enemies

MACABEBE, mä-kä bā'bā, Philippines, a pueblo of the province of Pampanga, Luzon, situated at the head of the Pampanga River delta, nine miles from Manila Bay and seven miles southeast of Bacolor. Pop 16,000.

MACABER (ma-ka'ber) DANCE. See DANCE OF DEATH.

MACADAM, măk-ăd'am, John Loudon, Scottish engineer b. Ayı, 21 Sept 1756; d Moffat, Dumfiiesshire, 26 Nov. 1836 In 1770 he was sent to an uncle at New York, where he remained during the War of Independence, and realized a considerable fortune as agent for the sale of prizes. At the close of the war he returned to Scotland, and in 1798 was appointed agent for revictualing the navy in the western ports of Great Britain, and took up his residence at Falmouth He afterward resided for many years at Bristol It was here, in 1815, on being appointed surveyor-general of the Bristol roads, that he resumed experiments he had made in Scotland, and first had full scope for putting in practice the important improvements in road-making which had long before occupied his thoughts By 1823 his general success was admitted; and in 1827 he was made general surveyor of roads. In carrying out his improvement he had expended several thousand pounds from his private resources; and the House of Commons, having been satisfied of the fact by the investigation of a committee, both reimbursed the actual outlay and presented him with an honorary tubute of 12,000, presenting to him a total of £10,000. His invention was rapidly introduced throughout the civilized world, and his own name was made synonymous with it

MACADAM, a modern system of road-making invented by J L Macadam (q.v.), which consists in forming the roads out of hard materials such as grainte, or basalt broken into pieces, none of which are too large to pass through an iron ing 2½ inches in diameter, and then deposited evenly in a bed of from 6 to 12 inches in thickness. The bed thus laid becomes perfectly compact and smooth, and in proportion as it is worn away or cut into ruts by traffic can easily be restored by a.new coating of materials See Roads and Road-Making.

McADOO, măk'a-doo', William Gibbs, American junst: b. near Knoxville, Tenn, 4 April 1820; d. 1894. He was graduated in 1845 from the East Tennessee University at Knoxville, sat in the Tennessee legislature 1845-46 and served in the Mexican War in 1847. He was afterward admitted to the bar and was attorney-general of the Knoxville judicial district, 1851-60. He removed to Georgia in 1862, served in the Confederate army during the Civil War and in 1871 became judge of the 20th judicial district of Georgia. He published a volume of poems and, with H. C. White, 'Elementary Geology of Tennessee.'

McADOO, William Gibbs, American cabinet officer: b. near Marietta, Ga., 31 Oct. 1863; d. Washington, D. C., 1 Feb. 1941. Descended from a distinguished Southern family, his father, Judge William Gibbs McAdoo, a jurist and a soldier of the Mexican and Civil wars, became attorney-general of Tennessee some years after losing his wealth in the general devastation in the South caused by the Civil War. The subject of this sketch was educated at the University of Tennessee and admitted to the bar in 1885, notwithstanding that circumstances obliged him to leave the university in his junior year and earn his living as a clerk of the United States Circuit Court. He practised law in Chattanooga till 1892, when he came to New York and opened a law office. In 1898 he

formed a law partnership with Mr William McAdoo (a native of Ireland and no relation whatever), who in 1910-30 was chief city magistrate, and was formerly Assistant Secretary of the Treasury under President Cleveland In his early days Mr. McAdoo had gained some practice in railroad work by running a street railway in Knoxville, an undertaking that proved a failure. His railroading propensities revived during his first years in New York City and he conceived the plan of tunneling the Hudson With the aid and confidence of capitalists he succeeded in carrying that great undertaking to a successful issue. In 1902 he undertaking to a successful issue organized the New York and New Jersey Railroad Company (now the Hudson and Manhattan, of which he was elected president and director), and completed the Hudson tunnel scheme. He was vice-chairman of the Democratic National Committee in 1912, and in the following year Mr Wilson, on his accession to the Presidency, invited him to take the office of Secretary of the Treasury. Mr. McAdoo severed his railroad connections and devoted himself to a task that was destined to become historic in the annals of national finance. The enormous financial transactions in which the United States government was involved owing to the European War are a matter of common knowledge The raising of huge war loans and the financing of Allied belligerents were only the more conspicuous events of Mr. McAdoo's tenure of the Treasury. He was a leading architect of the Federal Reserve System and an active promoter of the Federal Farm Loan System. Throughout the vast network of natural finance—tayation distribution of gaventonal finance—tayation distribution di tional finance—taxation, distribution of government funds, war-risk insurance and the insurance of soldiers and sailors, economic problems of trade and agriculture, etc, Mr. McAdoo handled the complex ramifications and details with remarkable facility and judgment. When the United States government took over the entire railroads of the country in January 1918 Mr. McAdoo was appointed Director-General of Railways. He resigned as Secretary of the Treasury 16 Dec. 1918 and as Director General of Railways 10 Jan. 1919. In 1920 and 1924 he was a candidate for the Democratic nomination for President, and in 1933-38 was member of the United States Senate from California. In 1885 he married Sarah Flemming (d 1912), and on 7 May 1914 he married Eleanor, daughter of President Wilson Divorced and remarried 1934–35 Wilson

McADOO, Pa., borough in Schuylkill County; alt. 1,836 feet; 5m. S. of Hazleton; on the Lehigh Valley, and the Pennsylvania railroads. There are rich deposits of anthracite coal in this area, and coal-mining is the principal industry. Other industries of the borough are the making of paper boxes and textiles. There are water falls near by, and picturesque scenery. The borough was founded in 1880. Pop. (1930) 5,239; (1940) 5,127.

McAFEE, măl a-fē, Cleland Boyd, American clergyman b. Fulton, Mo, 25 Sept 1866 He was educated at Park College, Union Theological Seminary, New York, and Westminster College, Missouri. He was ordained a Presbyterian minister in 1888, and from that date to 1891 he was professor of mental and moral philosophy in Park College. In 1901 became pastor of the Forty-first Street Presbyterian Church, Chicago, which he held until 1904, when he became pastor of the Lafayette Avenue Church, Brooklyn In 1912 he was made professor of didactic and polemical theology at the McCormick Theological Seminary, Chicago He received the degree of Ph.D. in 1892. Writings include 'Where He Is' (1898); 'Wherefore Didst Thou Doubt' (1900); 'Faith, Fellowship and Fealty' (1902); 'The Growing Church' (1903), 'The Worth of a Man' (1903); 'The Tenth Commandment' (1903): 'The Mosaic Law in Modern Life' ment) (1903); 'The Mosaic Law in Modern Life' (1905); 'Studies in the Sermon on the Mount' (1910); 'Gratest English Classic' (1912); 'His Peace' (1913); 'The Old and the New in Theology' (1914), and 'Psalms of the Social Life' (1917); 'The Christian Conviction' (1925); 'The Christian Message and Program' (1929).

McAFEE, Joseph Ernest, American clergyman; b. Louisiana, Mo, 4 April 1870 He is a brother of Cleland Boyd McAfee and was graduated from Park College in 1889, after which he studied in Union, Auburn and Princeton theological seminaries from 1889 to 1896. At Park College he taught Greek, the history of religion and ethics until 1906. In that year he became associate secretary of the Presbyterian Board of Home Missions of the Presbyterian Church in the United States, of which he was secretary 1914–17. In 1924 he became director of Community Service, Community Church, N Y. His publications include 'Missions Striking Home' (New York 1908); 'World Missions from the Home Base' (1911); 'Religion and the New American Democracy' (1917).

MACAIRE, mă-kar (Le Chevalier Richard), a French chanson de geste of the 12th century, and one of the great poems of the Middle Ages, the theme of which is the false accusa-tion brought against the queen of Charlemagne, called Blanchefleur *Macaire* is a fusion of two legends: that of the unjustly repudiated wife, and that of the dog that detects the murderer of his master Macaire, a French knight, aided by Lieutenant Landry, murdered Aubry de Montdidier (q v.) in the forest of Bondy. Mont-didier's dog, named Dragon, showed such aversion to Macaire that suspicion was aroused and Macaire and the dog were summoned to a single combat The result was fatal to Macaire, who died, confessing his guilt. Dragon was called the Chien de Montargis because the murder took place near the castle of Montargis. The encounter was depicted over the chimney of the great hall in the castle in the 15th century. Macaire is only preserved in the Franco-Venetian geste of Charlemagne (Bibl St. Mark MSS. XIII), in a mixed form of French and Venetian dialects. It has been reprinted several times. Consult 'Macaire' (Paris 1866), ed. Guessard in the series of 'Anciens poètes de la France'; Paris, Paulin, 'Hist litt. de la France' (Vol. XXIII, 1873); 'Gautier, L., 'Epopées françaises' (Vol. III, 3d ed, 1880); Paris, G., 'Hist. poét de Charlemagne' (1865). Jean de la Trille, 'Discours notable des duels' (Paris 1607). 1607), says the encounter with the dog took place under Charles V. The story was also told in another chanson de geste of the 12th century called 'La Reine Sibille,' which only exists in fragments. There are two French plays on the subject: one Le Chien de Montargis, by Guilbert de Pixérécourt (1814), which was translated and played at Covent Garden, London (1814); and the other, (In chien d'Aubry.

A manuscript in prose of 'Macaire' was found in the Bibliothèque de l'Arsénal in Paris about 1866.

MACAIRE, Robert, name of the villain in the French melodrama, 'Auberge des Adrets' (1823), in which Frédéric Lemaître made his reputation. The character was modified by Lemaître in his comedy 'Robert Macaire,' a sequel, in collaboration with Benjamin Antier. It was performed at the Theatre des Folics-Dramatiques, Paris, in 1834. In this, which Theophile Gautier calls "the great triumph of the revolutionary art" which followed the "Revolution of July," is expressed audacity and wit. It is an attack against social order. "Frédéric Lemaître," says Gautier, "created in the personage of Robert Macaire, a kind of humor that is almost Shakespearean. In it we find terrible gaiety, smister laughter, bitter derision, pitiless raillery and a biting sarcasm, mingled with elegance, suppleness and astonishing grace Robert Macaire and Bertrand are Don Quixote and Sancho Panza in crime." Consult Alhoy, Maurice, and Huart, L, 'Les cent Robert Macaire, composés et dessinés par H. Daumier' (Paris). Robert Louis Stevenson and W. E. Henley wrote a play 'Robert Macaire' (Stevenson's Works, Vol XX) Consult The New Review (Vol. XII, p. 685).

McALESTER, ma-kăl'ēs-ter, Miles Daniel, American general: b. New York, 1833; d. 1869. He was graduated from the United States Military Academy in 1856 and entering the engineer service became chief engineer of the Department of the Ohio in 1862. He served under Grant before Vicksburg and took part in the operations against Mobile.

McALESTER, Okla, city and Pittsburg County seat, alt. 750 feet, on the Missouri, Kansas and Texas and the Chicago, Rock Island and Pacific railroads, 62m. SW. of Muskogee, and on state and federal highways There is a municipal airport. The surrounding area presents much fertile farmland, together with coal and forest lands. Coal mining is the leading industry, but the processing of foods, cotton ginning, woodworking, and foundry operations are important factors in the city's economics. The city has some fine modern buildings; a Carnegie library; several social and civic organizations; good banks, hotels, churches, and schools A state penitentiary is located near by. J. J. McAlester, pioneer settler for whom the city was named, was the founder of North McAlester, which was incorporated in 1899. South McAlester was civically organized in 1900. They were consolidated, as McAlester, in 1906. The city is under commission government, administered by a mayor, six commissioners, and a city manager. Pop. (1930) 11,804; (1940) 12,401.

MACALESTER COLLEGE, Saint Paul, Minn., a coeducational institution, founded in 1885 under the auspices of the Presbyterian Church. A four-years' college course leads to the degrees of bachelor of arts and bachelor of science, and a conservatory of music grants the degree of bachelor of music. The average annual enrolment of students is 500, and its faculty 40. Its total endowment is \$1,640,000. It has excellent buildings and total resources of \$2,339,000. Its library has over 19,500 bound volumes. Its total income (tuition and endowment interest) is about \$186,000.

McALL (ma-kai') MISSION, a Protestant association founded in 1871 by Robert Whitaker McAll and his wife for religious work among the working people of France. On 17 Jan. 1872 the first station was opened in Belleville, one of the manufacturing suburbs of Paris. The work consists largely in striving to interest people in the questions pertaining to salvation of souls and then urging them to affiliate with some one of the nearby Protestant churches. No effort is made by the mission to establish churches, but some educational work has been begun in the large cities. Friends of the movement in America founded an American McAll Mission in 1883 with Philadelphia as headquarters, and there are also auxiliary societies in Great Britain, Canada and other countries.

Mcallen, Texas, city in Hidalgo County, alt. 122 feet, on the Southern Pacific and the Missouri Pacific radioads, 50m. NW. of Brownsville. Here citrus crops are grown on irrigated land, and canning is a dominant industry. The city was incorporated in 1909 It has mayor and council. Pop. (1930) 9,074; (1940) 11,877.

McALLISTER, Addams Stratton, American engineer b. Covington, Va, 24 Feb. 1875. He was educated at the Pennsylvania State College and at Cornell University. In 1898 he became electrical engineer for the Berwind-White Coal Mining Company and in 1899 held a similar position in the Westinghouse Electric and Manufacturing Company. In 1901 he was assistant in physics in Cornell, instructor in 1902-03 and acting assistant professor of electrical engineering there in 1903-04. He also was lecturer on engineering at the Pennsylvania State College in 1909-14. In 1905 he became associate editor of the *Electrical World* and in 1912 was editor of the Electrical World and in 1912 was made full editor of this publication. In 1917 he became secretary of American Engineering Service of Engineering, a member of national lighting committee of the Advisory Commission of Council of National Defense and also a member of the War Committee of Technical Societies. In 1914-15 he was president of the Illuminating Engineering Society, afterward becoming its chairman and secretary. In 1923 he became connected with the Bureau of Standards, Washington. Cornell gave him the degree of Ph.D. in 1905. He is the inventor of alternatingcurrent machinery. Dr. McAllister has contributed more than 100 articles on engineering to various technical journals and is the author of 'Alternating Current Motors' (1906; 3d. ed., 1909), and 'Standard Handbook for Electrical Engineers' (1907). He compiled and edited the 'National Directory of Commodity Specifications,' published by the United States Deaprtment of Commerce in 1925. ment of Commerce in 1925.

McALLISTER, Ward, American society leader: b. Savannah, Ga., about 1830; d 1895. He came of a family several of whose members were conspicuous at the bar. With his father, in 1850, he went to California, where he remained two years, and whence he removed to Newport, R. I., and afterward to New York City. Becoming possessed by marriage of a considerable fortune he was able, by means of influential connections through his mother and wife, to enter into social life with the advan-

tages of personal qualifications and family prestige. As a raconteur as we'll as an accomplished gourmet he had already attained prominence within a select circle when, by a well-turned remark, he became the leader of leaders in New York society, which, according to his strict limitation, included but 400 persons. The popular expression "The Four Hundred" originated from this assertion of McAllister's. He made contributions to the press, which, however, impaired rather than strengthened his unique position, as did also his volume "Society as I Have Found It" (1890).

McALLISTER, Fort. See Fort McALLISTER.

MACALLUM, Archibald Byron, Canadian educator b Belmont, Ontario, in 1859. After receiving his education in the Toronto and Johns Hopkins universities he became lecturer on physiology (1887) and professor in the medical faculty of Toronto University (1891–92). From 1892 to 1901 he was associate professor in the arts faculty there and full professor after 1901. In 1895–97 he was president of the Canadian Institute In 1901 he was made a Fellow of the Royal Society, Canada, and in 1906 of the Royal Society of London. In 1911 he was elected president of the American Society of Biochemists. He published scientific articles in the Journal of Physiology, Proceedings of the Royal Society Quarterly Journal of Microscopical Science, American Journal of Morphology and Journal of Anatomy and Physiology. D. 5 April 1934.

McALPINE, William Jarvis, American civil engineer. b: New York City, 30 April 1812; d. Staten Island, N. Y., 16 Feb 1890 Completing his elementary education at schools in Newburgh and Rome N. Y, young McAlpine was apprenticed at the age of 15 to John B. Jervis, civil engineer. He remained with Jervis for eight years as apprentice, assistant and resident engineer, and, in 1836, succeeded Jervis as chief engineer of the eastern division of the Erie Canal. Several years later, he became chief engineer of the government dry dock in Brooklyn, N. Y., and with the completion of that difficult project, found himself well established in his profession. From 1852-57 he served as state engineer and railway commissioner of New York, and, during his tenure of office, made a number of important studies on comparative costs of rail and water transportation. As chief engineer of the Third Avenue drawbridge over the Harlem River, New York (1860-61), Mr. McAlpine pioneered in the design and sinking of the caissons for the piers He later acted as chief or consulting engineer in the building of a number of the nation's largest bridges, among them the Eads Bridge, over the Mississippi at St. Louis; the Clifton suspension bridge at Niagara; and the Washington Bridge spanning the Harlem in New York City. He also directed the construction of the New York State Capitol at Albany in 1873, and later, as engineer of parks for New York City, built the famous Riverside Drive. At the time of his death, he was planning an «arcade railway» which was to provide an underground transit system for New York City, as well as second level streets beneath the more congested thoroughfares. Although remarkable in its conception and in many respects practicable, McAlpine's plan met with much opposition from property owners and was later abandoned. He was well known in professional circles in Europe and in England, and was consulted on a number of major projects, among them the Manchester Ship Canal, a proposed railroad to India, and improvement of navigation of the Danube River near the "Iron Gate" For many years he was the only American who could claim membership in the British Institution of Civil Engineers. He was elected president of the American Society of Civil Engineers in 1870, and honorary member in 1889. Mr. McAlpine was a frequent contributor to technical publications, and in addition to reports and a number of original papers, he wrote a textbook, 'Modern Engineering' (1874) At the time of his death he was the acknowledged dean of his profession, and one of the last of the "general practitioners" of civil engineering.

McANENY, George, American civic administrator b Greenville, N J, 24 Dec. 1869 He was graduated at the Jersey City High School in 1885 and entered journalism, serving on the staff of several New York newspapers from 1885 to 1892. From 1892 to 1894 he was assistant secretary of the Civil Service Reform League, of which he became secretary in 1894. He held this position until 1903, serving on committees that drafted the municipal homerule section of the state constitution in 1894 and the state Civil Service Law in 1899 In 1902 he was a member of the New York Civil Service Commission and also of the commission to revise the city charter in 1908. In 1903-06 he read law with Edward M. Shepard. In 1906-09 he was president of the City Club of New York; in 1910-13 he was president of the borough of Manhattan, and in 1914-16 president of the board of aldermen (fusion ticket), and was active in obtaining municipal markets for was active in obtaining municipal markets for New York City In 1902 he drafted the civil service rules now in force in New York City; was a member of the commission appointed by the governor to revise the New York City charter (1908); chairman of the transit committee of the New York board of estimate and apportionment, which, with the Public Service Commission, developed New York's subway system, and chairman of committee on city plan 1914–16. From 1916 to 1921 he was executive manager of the New York Times, resigning in the latter year to become a member and chairman of the New York Transit Commission. Following the abolition of this body in 1926 he resumed his position with the New York Times In 1913 Paris gave him the medal of the Société des Architectes Diplômes par le Gouvernment Français for services to city planning and architecture in the United States. Vice-president, Hampton Association National Municipal League, and president of the New York Kindergarten Association. In 1914 he was Dodge lecturer at Yale. The lectures were published under the title of 'Municipal Citizenship) (New York 1915). In 1924 he was Day Foundation lecturer at Union College.

MACAO, mä-kow' or ma-kä'ō, China, a Portuguese settlement and seaport on the west shore of the mouth of the Canton River, 40 miles west of Hongkong. It occupies a high peninsula, formerly the Island of Macao, but now united by a narrow isthmus north of the town with the island of Hiang-shan, and, with

the small islands of Taipa and Colôane, forms a province. The settlement is about eight miles in circuit, and its limits landward are defined by a barrier wall stretching across the isthmus, where a guard of Chinese troops is stationed to prevent foreigners from trespassing on the Inner Land. The town occupies a slope gradually descending to the sea, backed by a range of lofty hills, and having an extensive plain stretching east. It is nearly surrounded with water, and is open to the sea-bieezes on every side. The houses occupied by the foreign population are large, roomy and open, and the shops are numerous. The city is divided into two wards, one inhabited by Chinese and the other by non-Chinese, each with its own administrator. The quay or "Praya Grande" is commodious, forms a pleasant drive and is protected by a battery. The harbor is formed between the peninsula on which the town stands and the large island of Twee-lien-shan, to the west. Macao is considered the healthiest residence in southeast Asia with a mean annual temperature of 74°. Near it, in a beautiful garden, is the grotto in which the poet Camoens is said to have finished the 'Lusiad' The principal exports are tea, cassia and cassia oil, anise and anise oil, fish, and opium. The commerce (mainly in the hands of the Chinese), which is chiefly carried on with Hongkong, Canton, Batavia and Goa, has greatly declined since the opening of the rival free ports, and a considerable part of the colonial revenue is drawn from a tax on the gambling tables for which Macao is notorious. Imports in 1936 were valued at 15,723,585 patacas; exports at 9,143,627 patacas. (Pataca = 34 cents.) Trade is controlled by Chinese. The Portuguese first obtained permission to form a settlement and to trade at Macao in 1557. From 1563 they were required to pay a yearly tribute to the Chinese government, and their trading privileges were much restricted till 1844, when they were allowed to carry on commerce with the five ports then open to foreigners. Macao was then declared a free port, but the Chinese continued to ignore the territorial claims of the Portuguese until 1887 when a treaty was concluded. Macao from its convenient situation was the place of retreat for European merchants and missionaries when threatened by uprisings of race or religious feelings in China. Robert Morrison, the first Protestant missionary in China, was buried here. Pop. about 200,000 (4,000 Portuguese).

MACAPA, ma-ka-pa, Brazil, town on the delta of the Amazon, 110 miles from the mouth of that river. It has a fine harbor with fortifications. The exports are chiefly timber and fine woods for the furniture trade. Pop. 4,000.

MACAQUE, ma-kāk', one of the small, short-tailed Asiatic monkeys of the genus Macacus and family Cercopithecida, which are so docile, intelligent and interesting as a rule that they are common in menageries and frequently kept as pets; their gentleness and playfulness disappears as they grow old, however, and they are then likely to become morose and savage. They go about in troops, keeping by themselves, and differing from other monkeys in most of their actions and cries. Some of the best known are the quaintly crested capuchin or bonnetmonkey (M. sinicus), excessively common and pestiferous in southern India: the entellus mon-

key (q.v.) of northern India; the large pigtailed (M. leoninus) of Japan, whose likeness is seen in numberless Japanese drawings and carvings. Ranging over so wide a variety of countries, their habits and food differ greatly. Besides the fruit, juicy leaves and insects eaten by most monkeys they devour small reptiles, young birds, frogs and clabs, the last-named forming the principal diet of a Malayan species (M. cynomolgus). One species is isolated in the mountains of Algeria and Morocco, whence they were long ago carried, probably first to Gibialtar, where they are known to the English of the garrison as "Barbary apes" (M. unus), and the small band upon the Rock are carefully protected from harm.

MACARIANS, name given to the followers of the monastic customs of the elder Macarius of Egypt, or of the younger Macaius of Alexandria, contemporary monks of the 4th century who were noted for their austere rule. The name was also given to the followers of the Monothelite Macarius, patriarch of Antioch in the 7th century.

MACARONI (Ital. maccheroni), a pecuhar paste or dough prepared from wheat flour and manufactured into tubes or ribbons. It is an Italian invention, and, though made by a simple process, has never been produced with so great success in any other country. The grain grown in the more southern countries of Europe is said to possess a greater amount of gluten, and is therefore better adapted to this manufacture. The wheat, after being washed, is freed from the husks and ground in water mills, when hot water is added till it is of the consistency of stiff dough. Five different qualities of flour are obtained by an equal number of siftings, the last giving the finest and most delicate that can be made. To reduce the dough to tubes or ribbons a hollow cylindrical cast iron vessel is used, having the bottom perforated with holes or slits. When this is filled with the paste a heavy iron plate is driven in by a powerful press, which forces the paste through the holes and gives it the shape of the perforations, the workman cutting off the pieces of the desired length as they come through. During this process it is partially baked by a fire made under the cylinder. Sometimes the flat pieces are formed into tubes by uniting the edges before they are thoroughly dry. After being hung up for a few days they are ready for use The largest tubes are called maccheroni, the smaller vermicelli and the smallest fedelini. Macaroni is prepared for the table by boiling and baking with grated cheese, and is in common with vermicelli and the other varieties much used in the preparation of soups. Since about 1880 the use of macaroni in the United States has largely increased, and where it was once only consumed by Italians in this country, it is now eaten by all classes. Numerous macaroni factories have been established in New York and elsewhere. The United States imports annually from Italy over 5,000,000 pounds of macaroni.

MACARONIC VERSE (It. maccheronico, relating to macaroni, from maccheroni, macaroni), a type of humorous poetry in which modern words, given Latin endings, are introduced into Latin verse. The name is also given

to poetry which is merely a mixture of Latin (in some cases Greek) and the vernacular of the author. Macaronic verse is said to have originated with Teofilo Folengo (1491–1544), a learned Benedictine monk, who left his monastery and lived a worldly life, supporting himself by writing ridiculous poetry. His 'Liber Macaronicus' appeared in 1517 and was highly successful. One authority states, however, that Folengo was not the inventor of this verse form, a 'Carmen Macaronicum de Patavinis' having been published in 1490 by Tisi degli Odassi. The term macaronic was chosen with reference to the mixture of ingredients which go into the making of the food macaroni. Folengo's 'Liber Macaronicus' greatly influenced Rabelais' work, 'The Voyage of Pantagruel,' and was imitated by a number of minor Italian poets. In France in 1573, Antonius de Arena (Antoine de la Sable) published a mock epic on Charles V's campaign in Provence, after the style of Folengo's poem Moliere made use of macaronic verse in 'Le Malade imaginaire'; macaronic prose, however, is very rare. It is thought that this form of poetry might have been suggested by the barbarous Latin used by the monks. Consult Nodier, Charles, 'Du Langage factice appelé macaronique' (1834); Genthe, F. W., 'Geschichte der Macaronischen Poesie' (Leipzig, Halle, 1836); Sandys, William, 'Specimens of Macaronic Poetry' (London 1837); Morgan, J. A. (ed), 'Macaronic Poetry' (New York 1872), and Brunet, J. C., 'Littérature macaronique' (Paris 1879), Sullivan, Sister Carmeline, 'Latin Insertions and the Macaronic Verse in Piers Plowman' (Washington, D. C., 1932).

MacARTHUR, Arthur, United States Army officer b. Springfield, Mass., 2 June 1845; d. Mılwaukee, Wıs., 5 Sept. 1912. He entered the service during the Civil War as a first lieutenant in the 24th Wisconsin Infantry, in August 1862, and thereafter saw action in the battles of Perryville, Stone River, Dandridge, Franklin, and in the Atlanta campaign. He was mentioned in dispatches for «gallant and meritorious service,» and in 1890, was awarded the Congressional Medal of Honor for bravery in the battle of Missionary Ridge (1863). By the end of the war, he had been brevetted a colonel of the regiment. In February 1866, he entered the regular army, and from then until 1886, was stationed in the southwest, where he took part in several Indian campaigns. In May 1898, shortly after the beginning of the Spanish-American War, he was appointed brigadier general of volunteers, and assigned to the Philippines. In August of that year, he was commissioned major general of volunteers. In 1899, under Gen. Elwell Otis, he led a division against Agunaldo, and in 1900, was appointed commander of the Philippine Division, and succeeded General Otis as military governor of the islands He was promoted major general in the regular army in February 1901, and in 1906, was made assistant chief of staff of the United States Army, with the rank of lieutenant general. During the Russo-Japanese War, he was detailed as a special observer with the Japanese Army (1905). He was retired from active service in June 1909. Lieutenant General MacArthur was the father of General Douglas MacArthur (q.v.).

MacARTHUR, Douglas, American general. b. Little Rock, Ark., Jan. 26, 1880 Generally regarded as one of the ablest military leaders the United States has ever produced. General MacArthur is the son of the late Lieut. Gen. Arthur MacArthur (qv) whose own distinguished career included service in the Civil War, in the Philippines during the Spanish-American War, and a term as military governor of those islands. Young MacArthur was graduated from West Point at the head of his class in 1903; commissioned second lieutenant in the Corps of Engineers, and thereafter fulfilled a number of assignments—in the Philippines, on the Pacific Coast, in Japan, and in Washington (as aide de camp to President Theodore Roosevelt, 1906-07). During the next few years, he taught in army schools, and from April to September 1914, served with the Vera Cruz Expedition; from 1913-15 and 1916-17 he was a member of the General Staff; and in August 1917, was appointed chief of staff of the 42d (Rambow) Division, with the rank of colonel. In the First World War, he saw action in the Champagne-Marne and Aisne-Marne defensives; was promoted brigadier general in June 1918, and given command of the 84th Infantry Brigade, which he led in the St Mihiel, Essey, Pannes, Meuse-Argonne, and Sedan of fensives. He was twice wounded in action in 1918, and was cited for «extraordinary heroism,» having joined his men in battle in the du Fays salient, France. For his services in the war, he received from the United States the Distinguished Service Cross, the Distinguished Service Medal, and the Purple Heart From November 1918 until April 1919, he was with the Army of Occupation in Germany. Returning to the United States, he was appointed superintendent of the United States Military Academy, 12 June 1919, the youngest officer ever to hold that post. In 1922, he was again dispatched to the Philippines, and from June until November of that year was attached to headquarters, Philippine Department; from November 1922-June 1923, he commanded the District of Manula; and from June 1923-January 1925, the 23d Infantry Brigade at Fort William McKinley. (He was promoted major general 17 Jan. 1925.) After a period of service in the United States he was appointed commander of the Philippine Department in 1928. In November 1930, President Hoover named him chief of staff of the United States Army, which post carries with it the rank of general. At that time he was but 50 years of age, the youngest United States general since Grant. As chief of staff, he reorganized the nation's defenses, increased the air corps and the enlisted personnel, speeded up the army's mechanization, and urged co-ordination of air and ground forces President Roosevelt retained General MacArthur as chief of staff beyond his term of office in order that he might complete his reorganization program. In 1935, he was again sent to the Philippines (at the request of the Philippine president, the late Manuel Quezon) as military adviser to the Commonwealth government; and in June 1936, Quezon named him field marshal of the Philippine Army. On Dec. 31, 1937, General MacArthur was placed on the army's retired list, at his own request, but remained in the Philippines, and continued the organization of the islands' defenses and the building of a native army, in anticipation of the

Commonwealth's attaining its independence in 1945. On July 26, 1941, as American-Japanese relations grew more strained, he was recalled to active service, appointed commanding general of the Far East Command, and commissioned lieutenant general After Japan's attack on Pearl Harbor on Dec. 8, 1941 (December 7, U.S. time), he was named commander in chief of United States armed forces in the Far East, with the rank of full general, and charged with the defense of the islands He led American and Filipino troops against the Japanese, and when forced to abandon Manila on Dec 26, 1941, withdrew his forces to Bataan Peninsula. His magnificent defense of Bataan astounded military experts and endeared him to the American people. In March 1942, he was ordered by the late President Roosevelt to surrender his command to Maj. Gen. (now Gen.) Jonathan M. Wainwright, and evacuate to Australia. On March 16, he assumed command in that theater, with the title of commander in chief of Allied forces in the Southwest Pacific area On March 16, 1943, General MacArthur completed his first year in Australia, a year whose first weeks proved discouraging in the extreme, bringing to his command a slow and inadequate supply of men and matériel. He succeeded, however, in co-ordinating his forces, and in May 1942, made his first tentative move on the road back. Then followed in rapid succession the Japanese defeat in the Coral Sea in that same month; the Battle of Midway on June 7, which ended the Japanese threat to Hawaii; and on August 7, the beginning of the Solomon Islands campaign with the landing of U. S. Marines on Guadalcanal. In November 1942, General MacArthur personally directed the Allied drive from Port Moresby on the south coast of New Guinea, across the Owen Stanley Mountains, to the island's north coast, Stanley Mountains, to the island's north coast, and dislodged the Japanese from Buna and Gona On March 3, 1943, he announced the destruction in the Bismarck Sea of a 22-ship Japanese convoy advancing on New Guinea. With Admiral William F. Halsey, he launched a joint offensive in the Southwest Pacific on July 1, 1943. There followed Alled Ledger and Assessment in the followed Allied landings and conquests in the Gilberts, Marshalls, and the Marianas, pointing along the sea road to Tokyo. On Oct 20, 1944, General MacArthur made good his promise to return to the Philippines with the invasion of the Philippine island of Leyte; less than three months later, Jan. 9, 1945, he invaded Luzon. The ensuing liberation of Manila and reconquest of the Philippines paved the way for his operations in the Ryuku and other enemy-held archi-pelagos. When the Japanese government radioed its surrender offer on Aug. 14, 1945, General MacArthur, as senio. Allied officer in the Orient, was designated to arrange terms of capitulation with Japan's representatives. On Sept 2, aboard the U.S.S Missouri in Tokyo Bay he accepted Japan's formal surrender to the Allies. Thereafter he commanded the Allied Occupation Army.

MacARTHUR, Duncan, American pioneer: b. Dutchess County, N.Y., June 14, 1772; d. Ohio, 1839. His family removed in 1780 to the western frontier of Pennsylvania, and at 18 years of age he went to seek his fortune in the wilderness, and participated as a ranger or scout in the warfare with the Indians in Kentucky and Ohio, until the victory of General Wayne in 1794 gave peace to the Western country. About the commencement of the 19th century he

settled in Ohio as a surveyor, and in 1805 became a member of the Ohio legislature, and was appointed major general of the territorial militia. In the War of 1812 he received the commission of brigadier general in the army, and succeeded General Harrison in 1814 in command of the army of the West. After the peace, as a joint commissioner with General Cass, he negotiated the treaty with the Indians of Ohio for the sale of their lands in that state, which was ratified in 1818. He served again in the Ohio legislature 1815-21, and in 1823-25 was a Representative in Congress from that state. In

1830 he was elected governor of Olno

McARTHUR, John, Jr., American architect. b Bladenock, Wigtownshire, Scotland, May
13, 1823, d. Philadelphia, Pa, Jan 8, 1890. He came to the United States as a child and was apprenticed to his uncle, a Philadelphia carpenter. He later studied drawing and design at the Franklin Institute under Thomas U. Walter, architect and teacher. Thereafter, young McArthur had much practical experience in his chosen field, as apprentice, later as foreman and superintendent, and at the age of 26, won the first premium for a design of a building for the House of Refuge at Philadelphia. He soon became well established as an architect, and designed many important buildings, both public and private. Among them were the Public Ledger Building, the George W. Childs' mansion, both in Philadelphia; buildings at Lafay-ette College at Easton, Pa; and the State Asylum for the Insane at Danville, Pa. During the Civil War, he worked for the United States government, and was architect of the naval hospitals at Mare Island, Annapolis, and Phila-delphia. Some of his finest work was done in the construction of the Philadelphia City Hall or Public Buildings, at one time one of the two largest public buildings in the United States. Mr. McArthur's work was sound in construction and design, and lost nothing by comparison with that of his contemporaries. He was considered by many a worthy successor of Latrobe, Strickland, Mills, Haviland, and Walter, all self-trained designers and architects.

MacARTHUR, Robert Stuart, American Baptist clergyman: b. Dalesville, Quebec, July 31, 1841; d. Daytona Beach, Fla., Feb. 23, 1923. Graduated from University of Rochester, 1867, and from Rochester Theological Seminary, 1870, and from Rochester Theological Seminary, 1870, and from May 1870 to September 1911 was pastor of Calvary Baptist Church, New York, when he resigned, having been elected president of the Baptist World Alliance. He went to Russia to secure from the czar's government permission to buy land on which to erect a Baptist Bible College He later went to Burma as president of the alliance to assist in celebrate. as president of the alliance to assist in celebrat-ing the centennial anniversary of Adoniram ng the centennial anniversary of Adoniram Judson's mission work in Burma. He was for a long period connected editorially with the Christian Inquirer and Baptist Review, and lectured on foreign travel. His publications include Calvary Pulpit; Current Questions for Thinking Men; Lectures on the Land and the Book; Around the World; Old Testament Difficulties; Advent and Other Sermons; Royal Messages of Cheer and Comfort; The Christic Reign; The Old Book and the Old Faith; Divine Balustrades; The Celestial Lamp; The Question of the Centuries, and Quick Truths and Quaint Texts.

Texts.

McARTHUR, William Pope, American naval officer and hydrographer b. Ste Genevieve, Mo, 2 April 1814; d aboard ship, 23 Dec. 1850 In February 1832, he was appointed midshipman in the United States Navy, spent several years in the South Pacific station, and later attended the naval school at Norfolk, Va During the second Seminole War (1837–38), he commanded one of the vessels in the expedition to the Everglades He was assigned to duty with the United States Coast Survey in 1840, and in the following year, took part in the Gulf Coast Survey. Promoted lieutenant in 1841, in 1848 he commanded the hydrographic party that made the first preliminary survey and reconnaissance of the Pacific coastline from Monterey to the Columbia River. He died of acute dysentery as his ship entered Panama Harbor on the return voyage.

McARTHUR, Ohio, town and Vinton County seat; alt. 767 feet; on the Chesapeake and Ohio Railway, 75m SE of Columbus Local clays provide raw materials for brickmaking, the town's principal industry. McArthur was platted in 1815. Pop. (1940) 1,288.

MACASSAR, Celebes, the capital of a district of the same name in the island of Celebes on the west coast of the southern peninsula near the southern end of Macassar Strait sep-arating Celebes from Borneo It is the chief town of the Dutch government of Celebes. Macassar consists of the Dutch town and port, Vlaardingen, where the governor of Celebes resides, and the Malay town, which lies inland. The Portuguese claim to have visited Macassar in 1512; but there was no permanent Portuguese settlement until the 17th century when the English and Dutch also appeared on the scene. In 1660-68 the Dutch, after decisive victories on land and sea, succeeded in driving the Latins from Celebes and establishing themselves. All attempts of the English to supplant the Dutch were unsuccessful and the Dutch have been masters for two centuries and a half, with the exception of one short period of British occupation in the early 19th century. The impor-The important buildings are the official residence of the governor of Celebes; the new museum, containing a valuable collection of objects illustrative of the native arts and industries, arms, armor, costumes, choice fabrics and jewelry; and Fort Rotterdam, a relic of the time of Portuguese supremacy and its capture by the Dutch. According to A. S. Walcott, many of the inhabitants of Macassar live in the outlying kampongs to the north and south of the city proper. The houses of the kampongs, Walcott says, vary in many details from those in Java. They are generally raised several feet above the ground on poles, have gabled roofs, shuttered windows, and considerable ornamentation in the way of carved woodwork. Continuing Walcott says: «The people of this southern end of Celebes are nearly all either Macassarese, or Bugis. They resemble the Japanese in face and figure, but are more sturdily built and are decidedly less polite and pleasing in bearing and manners. The Bugis are the seamen of the Archipelago, the greatest navigators and the most enterprising traders today and in times gone by the greatest pirates as well. All the people of the coast districts of southern Celebes are in religious proclivities Mohametan-Animists-Mohametans

in their profession of faith, Animists and fetish-worshippers in their practices.» Macassar trades in coffee, rice, copra, trepang, spices, gum, rubber, pearls, mother-of-pearl, cocoa oil, maize, sandal wood and valuable timber Pop. about 84,500 Consult Walcott, Arthur S., 'Java and Her Neighbors' (New York 1914).

MACASSAR OIL, the trade name for an unguent that made its appearance in England early in the 19th century, manufactured by one Rowland It took its name from the district of Macassar, where it was first produced, being pressed from the fruit, or seed, of the Schleichera trijuga, the East Indian kusum tree. This fixed vegetable oil is used by the natives for cooking, illuminating and for medicinal purposes. The name is now given to a pomade made of almond, olive or peanut oil, to which other substances are added to give color and perfume The original Macassar oil became so well known that Byron spoke of it as «Thine incomparable oil, Macassar,» and Lewis Carroll alludes to it in the Song of the Man sitting on the Gate in 'Alice Through the Looking-glass' So general was its use that in England a covering was specially made to throw over the back of a chair or sofa as a protection from the grease in the hair; and to these coverings the name Anti-macassar was given. Anti-macassars were at first made of white cotton in crochet-work. They were stiff, hard and uncomfortable; but in the third quarter of the 19th century they were simpler and were more artistically worked in colored wools or crewels, or colored silks in pretty patterns. The Lady's Newspaper (1852) describes anti-macassar materials as «crochet cotton,» «pink and drab crochet twine,» etc. All the Year Round (1879) «the anti-macassar on the arm chair»; and Miss Braddon's 'Vixon' (1879) «To sit alone by the fireside and work anti-macassars in crewel» shows that the word was still familiar in England to a comparatively recent period. In the United States the word «tidy» was used to describe the article.

MACASSAR STRAIT, Battle of, a naval engagement in which American and Dutch warships and planes opposed a Japanese armada of some 100 ships in the Strait of Macassar between Borneo and Celebes on 23 Jan. 1942. In the battle which raged for five days and nights, the Japanese lost over 30 ships, sunk or damaged, including one battleship and an aircraft carrier, and between 25,000 and 30,000 men drowned. Although Japanese losses were high, the battle proved to be principally an Allied delaying action, and in February of that year, Japanese forces again advanced on Java, established bases on both sides of Celebes, and occupied Amboina Island, second most important naval base in the Dutch East Indies, and Timor, north of Australia.

north of Australia.

MACAULAY, ma-kâ'lĭ, Catharine Sawbridge, English historian: b. Wye, Kent, 2 April 1731; d. Binfield, Berkshire, 22 June 1791. In 1760 she was married to George Macaulay, a London physician. She was an ardent Republican and a great admirer of Washington, with whom she corresponded, and whom she visited in 1785. She published a 'History of England from the Accession of James I to the Revolution' (8 vols., 1763–71), once very popular and eulogized by Pitt in the House of Commons, but now neglected.

MACAULAY, James, Scottish novelist: b. Edinburgh, 22 May 1817; d there, 20 June 1902. He was educated at the University of Edinburgh and for 35 years was in the service of the Religious Tract Society as editor-in-chief. In 1851-57 he was joint editor of the Literary Gazette and in 1858 became editor of the Leisure Hour Sunday at Home The Boy's Own Paper and The Girl's Own Paper were founded He was a voluminous writer, and by him among his published works the following may be mentioned: 'Across the Ferry; First Impressions of America and its People' (1871);
'Memory Helps in British History' (1873); 'All True Records of Adventure' (1879);
'Luther Anecdotes' (1883); 'Gordon Anecdotes' (1885); 'Livingstone Anecdotes' (1886); 'Wonderful Stories of Daring, Peril and Adventure' (1887); and 'Victoria, Her Life and Reign (1887).

MACAULAY, Sir James Buchanan, Canadian jurist. b. Niagara, Ontario, 3 Dec 1793; d Toronto, 26 Nov. 1859 He was an ensign in the British army during the War of 1812, and subsequently studying law was admitted to the bar in 1822. In 1829 he was appointed a judge of the King's Bench, from 1849 to 1856 he was chief justice of the Court of Common Pleas, and just prior to his death became judge of the Court of Error and Appeal He was knighted in 1859.

MACAULAY, Thomas Babington, English essayist, historian and statesman b. Roth-ley Temple, Leicestershire, 25 Oct 1800; d. Holly Lodge, Kensington, 28 Dec 1859 Macaulay was the son of Zachary Macau-

lay, a Scotchman of remarkable character, who achieved distinction by his life-long advocacy of the abolition of slavery and by his efficiency, as a young man, in the governorship of Sierra Leone, the colony of African freedmen The family removed to Clapham, then a suburb of London, where much of Macaulay's youth was spent. Hannah More was a friend of the family and she encouraged the lad as a writer and presented him with books to start his library Young Macaulay was regarded as a prodigy, and his memory was something startling. He attended school near Cambridge under a Mr Preston; his range of reading, particularly in poetry and fiction, was immense, but his taste for mathematics and the exact sciences steadily declined. In October 1818 he entered Trinity College, Cambridge, and in the citadel of mathematics his aversion for this study became promounced. Twice he gained the Chancellor's medal for poetry, and he displayed classical attanments, but was "gulphed" in mathematics. However, after a third trial, he won a Fellowship in 1824. His mental training was thus one-sided; and a certain lack of philosophical grasp and a dislike of facing abstruse intellectual problems became thus characteristic. lectual problems became thus characteristic.

The association with his college mates, rather than his studies, left the deepest impression upon Macaulay. His great friend was Charles Austin, whose influence converted the young Tory into an uncompromising Whig. He shone in the Union Debating Society, developing powers that afterward became conspicuous in the House of Commons. Politics he had heard discussed from early childhood in the circles which gaznered round his father's table, and along with literature politics was his abiding passion. At college he had competed for a prize in history on the subject which he developed tuller in later years, and Character of William III. "The Conduct

Before leaving the university he began writing for publication in Knight's Quarterly Magazine (1823). Two lytics, 'Ivry' and 'Naseby' still live; but the most important contribution was the ingenious 'Conversation between Mr Abraham Cowley and Mr. John Milton, touching the great Civil War? It seems likely enough that the freshness and delicacy revealed in this early work became injured by the author's entrance into the rougher world of political strife. On the other hand, it may be maintained that Macaulay's gifts were pre-eminently those of the man in public life, and to him literature, always a delight, was nevertheless really but an avocation

Macaulay's father unexpectedly became financially involved Full of courage, the son began tutoring while still at Cambridge, and cheerfully assisted in supporting his sisters. Ultimately, together with his brother, he paid off all his father's obligations

Macaulay was called to the bar in 1826 and joined the Northern circuit; but soon gave up the law for politics Interestingly enough, his entrance into politics came by way of literature. In August 1825 appeared the essay on 'Milton,' the first of the series that Macaulay contributed to the Edinburgh Review, which, for the next 20 years, made both him and the Renew famous. Jeffrey, the editor, expressed his frank wonder as to where Macaulay "picked up that style" Upon Jeffrey's resignation Macaulay was offered the editorship, but he was not willing to leave London. Papers on 'Machi-avelli' (1827), 'Dryden,' 'History' and 'Hal-lam's Constitutional History' (1828), followed, and soon after controversial articles on James Mill, Sadler and Southey, which revealed the declared Whig. Their reputation introduced him into both social and political life. He was made commissioner of bankruptcy in 1828 and in 1830, Lord Lansdowne, who had been favorably impressed by the attack on Mill, offered Macaulay a seat in Parliament for Calne in Wiltshire which he held until in 1832 he was elected for Leeds.

His time of entrance into the House of Commons was propitious. It was just before the death of George IV and the accession of William IV, and consequently on the eve of the battle for the reforms of 1832. Macaulay was 30 years of age, was widely read in history and literature and was a ready and fluent speaker aflame with interest in public questions. In 1824 he had made a notable speech at a meeting of the Anti-Slavery Society; later, in the discussion for Catholic emancipation, he headed a coachload of M.A.'s from London to Cambridge, arriving in time to vote down a petition in the university senate against the act. He now threw himself ardently into the struggle for reform and took an honorable part in the fight from beginning to end. His Parliamentary success was immediate. «Whenever he rose to speak,» Mr. Gladstone testified, «it was a summons like a trumpet-call to fill the benches.» His earliest effort was on the removal of the civil disabilities of the Jews, which he followed by an essay on the subject in the

Edinburgh Review (January 1831). On the emancipation of slaves in the colonies he never wavered, but stood unflinchingly true to his father's principles. He offered to resign his position with the ministry rather than yield his views on this subject; but the question was satisfactorily settled and his resignation not accepted

Meanwhile he found time to write. The essays on 'Byron, 'Johnson' and 'Hampden' appeared in 1831; 'Burleigh' and 'Mirabeau,' in 1832; 'War of the Succession in Spain' and 'Horace Walpole,' in 1833, and the first essay

on (Chatham,) January 1834.

His appointment in 1832 as a commissioner of the Board of Control was followed by absorption in East Indian affairs, and in 1833, when the charter of the East India Company was renewed, he was offered a position on the East Indian Council with a salary of £10,000 per annum for five years. His brilliant career in Parliament was seemingly permanently endangered; but Macaulay did not hesitate He estimated that he could save half his salary and in five years have a competence He needed money on account of his father's poverty, for the sake of his two sisters, as well as for his own career; and he accepted, going out in 1834 and returning in 1838. The genius for government which the father had displayed at Sierre Leone, the son now manifested at Calcutta. His important permanent reforms were the creation of the Indian Penal Code and the Code for Criminal Procedure, achieved in the face of bitter local opposition, and the organization of a sound educational system.

Macaulay's family ties were very strong and there is no record of any love affair in his life A sister, Jane, had died in 1830, and his mother in 1831 One of his favorite sisters, Margaret, was married in 1832, an occurrence which he accepted as a source of personal distress. The other, Hannah, accompanied him to India, and there she met and was shortly married to Charles Trevelyan, an officer in the government service. Macaulay was much pleased with the match, and the two households lived together under the same roof. Ever afterward, as the young Trevelyans, his nieces and nephews, grew up, they became a very real part of Macaulay's life. His love for children, and particularly for these, was a marked trait, and one of them afterward filially wrote his uncle's biography. Meanwhile his sister Margaret had died in Engiand, and likewise his father died while Macaulay and the Trevelyans were on their homeward voyage. These deaths affected him deeply, and the home-coming was

a sad one.

While in India he made opportunity for an immense amount of reading, particularly of the Latin and Greek classics, to which he returned with increasing delight. He also read widely in Italian and French, and did some German on the return voyage. His love for the great poets, dramatists, orators and historians affected his culture, his style and his ideals. The lists of his reading from now to the end of his life became a part of his biography and would stock a good library. His long walks with a copy of Homer or Virgil, from which he was reading or spouting, became an accustomed sight. Thenceforward he determined that he would write a history in emulation of Thucy-

dides and Tacitus and Livy, and his set speeches caught something of the spirit of Lysias and Cicero.

Upon his return to England he left for a tour in Italy, revelling in its beauties and associations with the enthusiasm of a first visit and the eye of an historian and student of Latin and Italian literatures. The literary fruits were the 'Lays of Ancient Rome.'

Returned home, he sincerely hoped to begin his 'History of England,' which he had planned to write from the Revolution of 1688 to the death of George III Had he begun it then, with 20 years of life to devote to it, he might easily have left 10 or more volumes covering the century instead of the first five extending through but 15 years—a brilliant fragment. But he was again dragged into politics and Macvey Napier, editor of the Edinburgh Review, made heavy draughts upon his time.

In India he had contributed but two essays to the Review, that on 'Mackintosh's History' and the very long one on 'Bacon.' However, his experience furnished him the material for the brilliant narratives on 'Clive' (1840) and 'Warren Hastings' (1841). Besides these in the six years after his return he contributed 'Sir William Temple' (1838)—written in an entirely fresh spirit; 'Gladstone on Church and State' (1839); 'Von Ranke's History of the Popes' (1840); the 'Comic Dramatists of the Restoration' and 'Lord Holland' (1841); 'Frederick the Great' (1842); 'Mme. d'Arblay' and 'Addison' (1843); 'Barère' and the second essay on the 'Earl of Chatham' (1844). This, perhaps his noblest essay, proved to be his last. He was forced to give up writing in order to find time for his 'History' His complaisance in continuing to write for the Review had undoubtedly worked to his detriment. But the entrance into politics was only in part due to the exigencies of his friends; for public life exercised a subtle fascination over him

In 1839 he was elected member of Parliament for Edinburgh and was made Secretary at War with a seat in the Cabinet. Fortunately the ministry soon expired, and his freedom from official duties gave him some leisure. He retained, however, his seat for Edinburgh, and his most important work was the Copyright Bill, which, after many radical suggestions, passed in almost the exact terms in which he

advocated it.

In 1842 the 'Lays' appeared and achieved a great success despite the natural fears of friends. "Christopher North" of Blackwood's, who had attacked Macaulay on account of the Southey reviews, made up—on poetry they could agree. In 1843 the 'Essays' were collected and published. There had been a constantly growing demand for them in a permanent form, which their author at first resisted. They had been written at odd moments of leisure, and he regarded them as ephemeral, but copies were being introduced from America, and Macaulay had to consent. The sale proved their popularity to be a permanent one. Macaulay's Essays still are unapproached of their kind, as condensed booklets of knowledge. An analysis of their contents shows how their author's mind was revolving constantly upon a definite period of English history—the Revolution and the consequent development under constitutional government, the subject he set

for himself in writing his 'History'— and these are uniformly among his best. Those on forare uniformly among his best. Those on for-eign subjects and the controversial ones are

less satisfying

The 'History' had been delayed year after year for lack of leisure to begin actual work. At length the first two volumes appeared in They comprised the reign of James II and the Revolution, but reproduced the setting as a whole and included details at once picturesque and dramatic such as could only be drawn by a supreme master of narrative. Macaulay had set for himself high ideals; he wished to be read and to be understood; he sought to give a series of brilliant mental pictures; and he achieved what he set out to do. He is weakest, perhaps, on the side of ethical interpretation, in scarching out the causes and setting forth the nexus of events; his narrative is brilliant and effective, but it has the supreme fault in a history of being entirely lacking in detachment of view. In opinions he represented the great middle class and the world of Whiggism and its mode of thinking, in many things, Philistine; in some things, even vulgar; where mysticism and all esoteric systems of philosophy and kindred schools of poetry were accounted as foolishness

The popularity of the 'History' was something enormous, surpassing even that of Byron's poems and of Scott's and Dickens' novels In 1849, in consequence of this success, Macaulay was made rector of the University of Glasgow and Fellow of the Royal Society He had been appointed trustee of the British Museum in 1847 He declined a professorship of history at Cambridge, and steadily refused positions under the government which would take up his

He had represented Edinburgh in Parliament for eight years, when in 1847, on account of his characteristic independence in voting for the Maynooth grant — for the maintenance of a Catholic university in Ireland - he offended many Edinburgh electors, and was not returned at the polls He accepted his defeat with relief, and turned the more eagerly to the 'History.' In 1852, without any solicitation on his part and with a steady refusal to give pledges, he was returned voluntarily by the electors of Edin-burgh to his former seat. Under such circumstances he felt he could not refuse election; but the duties it involved aided in sapping his strength, and that year he had a spell of illness from which he never wholly recovered.

In 1853 his speeches were collected and pub-In 1855 the third and fourth volumes of his 'History' appeared. Macaulay feared for their success after the splendid reception accorded to the former two; but the new subject was the life and career of William of Orange, his favorite hero, he had worked hard to sustain himself and 26,500 copies were sold in 10 weeks. In 1856 he withdrew from the House of Commons; and in 1857 he was made a peer, and chose the title, Baron Macaulay of Rothley, from his birthplace. Likewise this year he was made a foreign member of the French Academy, member of the Prussian Order of Merit and high steward of Cambridge. In 1858 he wrote five short biographies for the eighth edition of the Encyclopedia Britannica — Atterbury, Bunyan, Goldsmith, Johnson and Pitt. These show greater compactness and maturity in judgment than his earlier treatment of the same themes.

In 1856 he left his bachelor quarters in town, at The Albany, and leased a pleasant villa, Holly Lodge, Campden Hill, Kensington In 1859 his brother-in-law, now Sii Charles Trevelyan, was appointed governor of Madras, and the thought of the separation bore heavily upon Fortunately his sister and the children remained behind a while longer. Macaulay had not been well for some time, and he died at Holly Lodge, 28 December On 9 Jan. 1860, Holly Lodge, 28 December On 9 Jan. 1860, he was buried in Westminster Abbey in the

Poets' Corner at the foot of Addison's statue.

A fifth volume of the 'History,' concluding the reign of William III, had been completed, was edited posthumously by Lady Trevelyan and appeared in 1861. See MACAULAY'S ESSAYS;

LAYS OF ANCIENT ROME
Bibliography.—The official life, written by
George (afterward Sir George) Otto Trevelyan (his nephew), appeared in London in 1876, and is generally conceded to be one of the best biographies in the English language. Consult also Lord Avebury, 'Essays and Addresses' (London 1903); Bagehot, Walter, 'Literary Studies' (ib. 1879); Cannung, 'Lord Macaulay and his History' (ib. 1822); Hughes, D. A., 'Thomas Babrigton Macaulay the Rhetorician: an Examination of his Structural Devices' (Ithaca, N. Y., 1898); Macgregor, D. II., 'Lord Macaulay' (London 1901), Viscount Morley, 'Critical Miscellanies' (ib. 1877); Morrison, I. Cotter, 'Macaulay' in the 'Engis generally conceded to be one of the best Morrison, J. Cotter, 'Macaulay' in the 'English Men of Letters' (ib. 1882); Spedding, 'Evenings with a Reviewer' (ib. 1881). J. B. HENNEMAN,

Late Professor of English in the University of the South.

MACAULAY'S ESSAYS. Macaulay did not originate the essay of literary and historical criticism. But Macaulay's essays so far surpass all others in brilliancy, style and solidity of matter that his name ranks with those of Bacon and Montaigne, each a master in his own special Macaulay's first published articles, written while he was still in residence at Cambridge University, appeared in Knight's Quarterly Magazine in 1823 and 1824, and from that time until his death in 1859 he wrote two score essays for the Edinburgh Review and many articles for the Encyclopædia Britannica. The subjects he wrote upon were many - Dante, Dryden, Mill on Government, Mr. Robert Mont-gomery's poems, Moore's Life of Byron, Lord Bacon, Von Ranke, Leigh Hunt, Frederick the Great, Madame d'Arblay, Barère, etc., but by far the greater number deal with poets and men of letters or political personages in English history. Perhaps his most famous essays are those on Lord Clive, Warren Hastings and William Pitt, but others that deal with men of letters, Addison, for instance, or Samuel Johnson, are just as brilliant.

Macaulay's essays are set off by all the arts of rhetoric; they are ornamented by all the resources of omnivorous reading and a marvelous memory; they sparkle with a youthful enthusiasm, and are compact of sound information. In their own class they have no rivals. They are books to be taken on a long sea voyage, to be put on the shelf of a lonely ranchman, to be read and reread by all who have any taste for

literature Pick up the essay on Addison and you are delighted with the tender sympathy of the critic who can set forth a good man's character in so generous and beautiful a manner Read that on Croker's edition of 'Boswell's Johnson,' and you not only derive pleasure from Macaulay's admiration for Johnson, but you also get a lively idea of what the editor of a biography should not do. Take up any essay you please and you find knowledge, wit, sympathy, admiration; you are delighted to find with what extraordinary ease you acquire informa-tion, and how your horizon rapidly reaches out as if you were going up in a balloon, how places and things once so dark become enveloped in light as if the sun were rising, how great historical events seem to have been familiar to you from boyhood and how eminent personages, hitherto unknown, leap into your sudden intimacy

Thus to delight, in form, and exhilarate the reader is a wonderful feat, and for nine men out of 10 Macaulay's essays are wholly satisfactory. They give a busy man what he wants to get from history and literature; but the 10th get from history and includes, satisfied. He man finds himself not wholly satisfied. He animated pages, paragraphs, sentences that advance upon him, rank by rank, marshaled according to the most brilliant rules of tactics and strategy, trouble his spirit Not a single sentence, here or there, appears in undress uniform Such prose affords no room for subtle-And the author's dogmatism rings in our ears like a trumpet in a room; this world of ours so full of perplexities, uncertainties, obscurities, cannot be truly expressed in opinions of absolute definiteness. History, literature, art, are not mathematics; a column of figures adds up the same for all; but William of Orange, James the Second, Archbishop Laud, Alexander Pope, Francis Bacon, must seem different to different people. We need, in literature, in history, light and shade, we need twilight and even night; high noon all the time is intolerable. It seems unlikely that all right views on English politics, during the 17th, 18th and 19th centuries, were embodied in the Whig creed, that all the good in religion is with the Protestants and none with Roman Catholics, that a comparative estimate of national characters summed up in the phrase "as the Italian is to the Englishman, as the Hindoo is to the Italian, as the Bengal is to other Hindoos," etc., should not need explanations and qualifica-tions. And why should a historical writer, all the time, be giving his personages good or bad marks for conduct, like a village schoolmaster?

Such faults certainly exist. Macaulay had the temperament and the manner of an orator. He took, or rather he inherited, a view, he accepted it unquestioningly with enthusiasm, even with passion, he expressed that view in as absolute and as lucid a manner as possible He had the method of an orator whose oration will be heard but once, and who must be positive in order to convince. This may be a merit in an advocate but it is a grave fault in a writer; and one would say that with such a fault it would be impossible for a man to be a great writer. But this very fault is proof of Macaulay's extraordinary talents; with his eloquence, with his immense fund of information, with his obvious honesty and his contagious enthusiasm, he is able to cover up and conceal what in any other writer would be fatal defects.

A man without doubts, without metaphysics, without high imagination, without dreams, cannot be one of the world's greatest writers; but Macaulay was a great English writer and occupies a place in which he not only has no rival, but no competitor who can be compared with him. CARL E EGGERT.

MACAULAY, Trevelyan's Life_of. authoritative biography of Thomas Babington Macaulay is the 'Life and Letters' by Sir George Otto Trevelyan. It is likely always to remain the chief source of information on account of the opportunity open to the biographer of knowing the subject thoroughly and of having free access to all available material. The writer is a nephew of Lord Macaulay, the son of Hannah More Macaulay, one of the historian's favorite sisters; from his earliest boyhood he knew his uncle intimately, and was 21 years old when Macaulay died in December 1859 Lady Trevelyan bequeathed to her son the task of writing his uncle's biography, a task that occupied many years, the completed

work appearing in 1876

The excellence of the work was recognized from the first. John Morley and William Ewart Gladstone approved it at once in extensive reviews, and succeeding years have detracted not at all from their judgments. Mr. Morley commended "the skill and candor with which Mr. Trevelyan has executed a very delicate and difficult task." Excellent and abuncate and difficult task." cate and difficult task" Excellent and abundant materials and extensive knowledge do not necessarily ensure the production of a great biography. Nor do intimacy and strong affection; close relationship, indeed, is frequently the snare that prevents success. It is a tribute to Trevelyan's genius that he was not blinded by relationship or affection, nor overcome by the excess of material with which he had to deal. The biography exhibits careful selection. If now and then the loyal nephew is unable to see anything but good in the famous uncle, he nevertheless does not represent him as faultless; he admits that Macaulay had both limitations and prejudices. Trevelyan does not intrude himself unduly upon the narrative: he keeps our Gladstone said that one of the greatest merits of Trevelyan's work is the fact that it has movement—life. And Gladstone was right. The biography is no lifeless transcript of facts; it is a characterization and an interpretation, possessing all the qualities of the best artistic work — proper perspective, proportion, gradation. The style is attractive and contributes much to the delight of reading.

Trevelyan adopted the method employed and established by Boswell, that of allowing the subject to tell, "as far as possible," his own story. The 'Life of Macaulay' is sometimes, to be sure, mentioned along with the 'Life of Johnson, and there is no doubt that it has taken its place as one of the greatest English biographies. It is true, however, that with all of the advantages open to Trevelyan, he yet falls short of the success attained by Boswell. The 'Macaulay' contains no such record of conversation, no such variety of "exquisite personal touches," no such dramatic quality as the 'Johnson.') Neither does it so freely portray faults and foi-bles. Falling somewhat short of the 'Life of Johnson' in sheer artistry, it surpasses Lockhart's 'Life of Scott' in movement and concentration. Morley was giving high yet just praise when he expressed the belief that this 'Life of Macaulay' would be read throughout the world with a curiosity and an interest only to be surpassed by the success of Lord Macaulay's own writings Consult the review of the 'Life' by John Morley (in the Edmburgh Review, Vol. 143); and that by Gladstone (in the Quarterly Review, Vol. 142). Waldo H. Dunn.

McAULEY, Catherine, Irish founder and first superior of the Sisters of Mercy b Stormont House, County Dublin, Ireland, 29 Sept 1787; d Dublin, 11 Nov 1841 In childhood she was adopted by a wealthy Protestant family who allowed her to remain in the church of her father, the Roman Catholic, and left her a large fortune which she wished to use for the benefit of the poor. She first erected a commodious house wherein might be taught a number of poor children, and where homeless young women might find lodging and board. This institution was opened in Dublin, 24 Sept 1827 but the religious order was not established until 12 Dec. 1831 The members of the order take the vows of poverty, chastity and obedience; and the works which they perform are visiting the poor, sick and imprisoned, teaching, establishing hospitals, orphanages, homes for the friendless and other works of mercy. There are houses of her order in nearly all parts of the world. In the United States it comprises over 4,700 members. The order includes a college for young women, at Mount Washington, Md., a large number of academies, high and elementary schools and hospitals and orphanages in nearly every State in the Union. Consult Hartnett, 'Memoir of Mother McAuley'; Murphy, 'Sketches of Irish Nunnerics'; Member of Order of Mercy, 'Life of Catherine McAuley.' See MERCY, SISTERS OF

McAULEY, m'ka'li, "Jerry," New York City missionary b. Ireland, in 1839, d New York City, 18 Sept. 1884. He came to New York in 1852 and became a thief and prize-fighter. In 1857 he was sent to Sing Sing prison on a false charge of highway robbery, but was pardoned in 1864. He returned to his evil life. In 1872, having reformed, he opened a mission, "The Helping Hand," in Water street, a criminal neighborhood in New York. In 1882 he opened another mission, "The Jerry McAuley Cremorne Mission" and in 1883 began the publication of Jerry McAuley's Newspaper He appealed with the greatest success to outcasts considered beyond redemption. After his death the work was continued by Samuel H. Hadley and John H. Wyburn. In 1912 a modern sanitary building was erected on the site of the first mission in Water street Consult (Jerry McAuley: his Life and Work,) autobiography edited by the Rev. Robert M. Offord (New York 1885).

MACAW, ma'ka', name given to 15 or more species of large, long-tailed and strongflying parrots of gaudy coloring. They belong to the genus Ara, and are natives of the Western Hemisphere. They live on the mainland of America from Mexico to Paraguay, being especially abundant in Bolivia, where no fewer than seven (or nearly one-half) are found. They are also in Colombia and in Cuba. In the true macaws (Ara) the bony orbitical ring is complete and the lores (space between the eye

and the upper mandible) and, to a greater or less extent, the cheeks are naked. One of the handsomest and best known is the Blue and Yellow Macaw (Ara ararauna), which enjoys an extensive range in South America from Cruiana in the east to Colombia in the west and from Panama to Bolivia A little over 30 mehes long it has the upper parts blue, the forehead olive-green and the ear-coverts, sides of neck, breast and abdomen yellow-orange, while the wings and long tail are blue above and golden olive-yellow below. This bird is seen in almost every zoological garden and is often kept in private houses. It possesses a fairly good temper and grows much attached to those who tend it, but, like all other macaws, it persists in violent screaming. Salmon-fishers use its feathers for the making of artificial flies Larger and even more gorgeously plumaged is the great Red and Blue Macaw (Ara mação), which is mainly scarlet-red both above and below, but with the back and upper and lower tail coverts pale blue, as are the wingquills, while the shoulders and greater coverts are chrome yellow. The tail feathers are scarlet, the two central ones scarcely tipped with blue, the blue tips increasing in extent on the outer feathers, the three outermost being almost exclusively blue. The home of the Red and Blue Macaw extends from Mexico, through Gentral America, to Bolivia, Gunana and the Amazon Valley. It is usually seen in pairs, or in companies of pairs. It is also a common bird in captivity. The Red and Green Macaw (Ara chlocoptera), ranging from Panama to Brazil, has a shorter tail than the other two and is not so frequently met with in zoological gardens It does not extend north of Panama. It differs from the Red and Blue in being of a darker red, or crimson, and having the middle wing coverts olive-green instead of yellow The Green Macaw (Ara milateris) is green throughout, except for the presence of a scarlet patch on the forehead and blue on back, rump, wings and tail. It is 27 inches long and ranges from Mexico to Peru and Bolivia,—the most northern of all in distribution It is well known in captivity Colonel Grayson and other writers explain that this macaw is called "guacamayo" by the natives of Mexico and Central America, because they believe that it descends to the ground only once a year, and this in the month of May, when it searches the ground for a very haid-shelled palm-nut of which it is fond. This rather surprising statement is probably substantially true, as there seems no other reason why it should ever alight on the ground, where it would be exposed to much more danger than in the tree-tops, where it finds abundant food the year round. The tree of this nut the Mexicans call Ava, a species of Nux vomica. Both the milky sap of the tree, as well as the fruit, are deadly poison to any other creature but this parrot. The shell is exceedingly hard, but the enormous bill and powerful jaws of the Guacamayo enables it to split the nut with ease. When migrating to some distance these birds pass at a great height, flying in pairs and uttering harsh and discordant cries

The Hyacinthine Macaw (Ara hyacinthus) of the central provinces of Brazil is a splendid bird. It is about three feet long, the plumage being nearly uniform cobalt blue, relieved by

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bright yellow skin about the eyes and at the base of the lower mandible and a black bill which is of enormous size. This appears to be a rare species, occurring, according to Riker, about the inland ponds in the dense forests of the interior, where it feeds chiefly upon the fruit of a palm peculiar to these localities. Some of these palm fruits are of extraordinary hardness, but these birds crush them to pulp by their bills. The nesting habits of the Hyacinthine differ from those of other macaws in that they excavate a hole in the river bank for their nest instead of placing it in a hollow tree. In Spixi Macaw (Cynopsitiacus Spixi), of the province of Bahia, Brazil, the lores are naked and the general color also blue; but parts of the head are more or less grayish.

All macaws live well in captivity and are often kept chained to a perch. Few persons are acquainted with their strong, wonderful and graceful flight. They all scream harshly They are gregarious and apparently monogamous, and lay two lustreless white eggs in nests in hollow trees. One of their characteristics is a long and graduated tail with the individual feathers tapering to a point and the middle pair always the longest. The bill is powerful and usually deeper than long. Consult Greene, William Thomas, 'Parrots in Captivity,' with notes (3 vols, London 1884–87); id, 'Parrots in Captivity,' colored illustration (London 1884); Lear, Edward, 'Illustrations of the Family of Psittacidae, or Parrots' (folio, London 1832); Page, Charles N, 'Parrots and Other Talking Birds. their Foods, Care and Training' (Des Moines 1906)

MACAW TREE (Acrocomia sclerocarpa), a palm of the same family as the cocoanut. It is a native of the West Indies and of the warm parts of America. It grows from 20 to 30 feet high with pinnated leaves from 10 to 15 feet long. The fruit yields oil of a yellowish hue, sweetish taste and with an odor like violets. This oil is about the consistency of butter. In the native regions of the tree the inhabitants use this oil as an emollient for affections of the joints. It is extensively imported and is used in the manufacture of toilet soaps as palm oil. The leaves yield a fine, soft fibre. In Guiana the tree is called Macoya, in Brazil it is called Macahuba, in Jamaica Grugru. In southern California this palm is cultivated as an ornamental tree.

MACAYO, ma-sī-ō, Brazil. See Maceio. MACBETH, or MACBETHAD, Mac-Finlegh, king of Scotland, who reigned from 1040 to 1057. The facts of his life, so far as known, are these During the reign of Duncan he was "mormaer" of Moray by inheritance, and by his marriage with Gruoch, granddaughter of Kenneth IV. Duncan, in his attempt to subdue the independent chiefs of the north, was defeated in a battle with the Earl of Orkney and Shetland at Burghead, near Elgin in 1040; but was murdered at Pitgaveny, nine miles from the battlefield, by Macbeth, his general. By this means Macbeth became king, and, according to accounts, his reign was fairly successful. He was finally defeated in battle and slain by Malcolm Ceannmor, son of the murdered Duncan, at Lumphanan, Aberdeen (1057). The legends which gradually gathered round the name of Macbeth were collected by John of

Fordun and Hector Boece, reproduced by Holinshed in his 'Chronicle' (1577) and made use of by Shakespeare for his great tragedy These writers appear to have overlooked the excellent qualities of Macbeth as king, and regarded him with horror as a usurper Consult Robertson, 'Scotland under her Early Kings' (1862); Skene, 'Celtic Scotland' (1876-80), and Rhys, E, 'Celtic Britain' (3d ed., London 1904)

MACBETH. This play was not published until 1623, though it was probably written several years before Shakespeare's death. A reference to it in 1610 by Dr. Simon Forman, the probable reference to the accession of James the First (1603) that brought about the union of two crowns, and the proportion of rhyme, blank verse and prose, point to 1605-06 as the probable date Because of its late publication the text is one of the most corrupt of Shakespeare's plays It may have been taken down from the play as acted, or it may be a transcript of the author's manuscript which was in great part not copied from the original but written to dictation. Act 1, scene 2, and part of scene 3 may be an interpolation, but the Porter Scene, which was long considered to be the work of a collaborator, is now justified by reason of its dramatic contrast with the preceding scene and by the amazing felicity of such lines as, "go the primrose way to the everlasting bonfire." With the exception of a few lines and scenes Macbeth is an example of amazing concentration it has neither underplot, nor, with the excep-tion of the Porter Scene, such comic scenes as are found in nearly all of the other tragedies of Shakespeare It is shorter by some thousand lines than any other tragedy and moves along with the swiftness of a tempest. The 20 years of history become nine days of dramatic time, and so swift is the passage of time that it seems but a few hours.

Shakespeare was indebted for the main events of the play to Holmshed's 'Chronicles of Scotland.' The character and the story of Macbeth, partly historical and partly legendary, were drawn largely from this source, but the witches were the creation of Shakespeare's genius from the shadowy creatures of a crude folklore There is just enough of the popular conception of supernatural creatures of evil to satisfy the demands of the age in which he lived, but he informed this popular and somewhat vulgar superstition with a moral significance suited to all ages alike. These invisible, unearthly creatures do not create the evil in Macbeth's mind; they only serve to bring into life-like reality the evil that is already there. They are an embodiment of the same forces as the thunder, lightning, rain - nature "red in tooth and claw" — that constitute the background for the evil forces that are at play in this drama. While the minor characters of the play, and especially Banquo, are adequately presented, the interest centres in Macbeth and Lady Mac-beth, who while engaged in the same evil deeds yet reveal differences of temperament and character that afford the most significant dramatic contrasts. Lady Macbeth before the murder of Duncan displays firm, sharp, wiry, matter-offact intellect and energy of will; she becomes for the time being possessed by one thought, one ambition. She has no imagination to represent for her the inevitable consequences of the murder As soon, however, as the deed is done, her womanly nature asserts itself; her amazing self-control gives way, and remorse wells up in her conscience-tortured heart. She had denied the quality of her sex, only to find that the woman was stronger than the queen or the wife. Macbeth, on the other hand, is possessed from the beginning by a vivid imagination that visualizes the deed itself and falters at its contemplation. Deeper and deeper he plunges into guilt until a sort of world-weariness and sick despair settle upon his brooding spiit. In words as eloquent as Shakespeare ever wrote he pronounces a requiem upon his wife and summarizes his pessimistic indictment of old age and of life; life is to him but "a tale told by an idiot, full of sound and fury, signifying nothing" He dies with the harness on his back, the intrepid soldier that he has always been, but with a sigh that pierces to the depths.

McBRIDE, måk-brid, Sir Richard, Canadian statesman: b. New Westminster, British Columbia, 15 Dec. 1870, where his father held office; d England, 1917. He was educated at Dalhousie University, Halifax, Nova Scotia, graduating in 1890, called to the bar in 1892, he practised his profession in Victoria. Entering politics he was elected in 1898 a Conservative of the provincial legislature. In 1900-01 he was Minister of Mines in the Provincial Ministry; in 1902-03 a leader of the Conservative opposition; in 1903 Premier and Minister of Mines; in 1906 a delegate to the Interprovincial Conference at Ottawa; and in 1907 a delegate to the Colonial Conference at London (England). In 1912 he was knighted. Consult Gregg, T. A., 'Richard McBride,' with portrait, Canadian Magazine (July 1904).

MACBRIDE, Thomas Huston, American educator and botanist: b Rogersville, Tenn., 31 July 1848. After graduation at Monmouth College in 1869 he taught mathematics and modern languages at Lenox College from 1870 till 1878, in which year he became assistant professor of natural sciences. In 1884 he was made professor of botany and held this post until 1914 when he became president. From 1916 he was president emeritus. His specialty was fungi Dr. Macbride had many degrees. Monmouth gave him A.M. in 1873, the University of Bonn the same in 1891; Lenox gave him Ph D. in 1895; Monmouth that of LL.D. in 1914, and Coe the same in 1915. He was a member of many scientific societies, of the American Forestry Association, Iowa Park and Forestry Association, Iowa Park and Forestry Association, Iowa Park and Forestry Association and of the Society of Botanists of the Central States. He was also a Fellow of the Botanical Society of America. He published many of his lectures and addresses, contributed to the Popular Science Monthly, Science, etc., and was the author of a textbook on Botany (1895) and 'North American Slime Moulds' (1899). He died 27 March 1934.

McBURNEY, mak-ber'ni, Charles, American surgeon: b. Roxbury, Mass, 17 Feb. 1845; d. 1913. He was graduated at Harvard in 1866; and from the Columbia Medical School in 1870, and thereafter practised his profession in New York. He was professor of surgery in the College of Physicians and Surgeons, New York, and was visiting and consulting surgeon

at Saint Luke's, the Presbyterian, Roosevelt, New York Orthopedic and other hospitals. He became widely known as a very skilful operative surgeon, and was Fellow or member of many medical societies of this country and Europe He discovered "McBurney's point," which is pathognomonic of appendicitis. He was a world-wide authority on appendicitis. When President McKinley was shot, Di. McBurney was summoned to Buffalo as consulting surgeon. He was a great teacher as well as a great surgeon.

McBURNEY, Robert Raikes, American religious worker b Castleblaney, Ireland, 31 March 1837; d. Clifton Springs, N. Y, 27 Dec. 1898. He came to the United States in 1854, and from 1862 was the general secretary of the New York Young Men's Christian Association. He was devoted to his work, and with the progress of years came to be recognized as the leading Y. M. C. A secretary in the world.

McCABE, ma-kāb', Charles Cardwell, American Methodist bishop: h Atheus, Ohio, 11 Oct. 1836; d New York, 19 Dec. 1906. He was educated at Ohio Wesleyau University. In 1860 he entered the Methodist Episcopal ministry, and in 1862 was appointed chaplain of the 122d Ohio Infantry. At the battle of Winchester he was captured, and held in Libby prison for four months, and soon after his release entered the service of the United States Christian Commission and succeeded in raising a large amount of money for its work. Later he became financial agent for Wesleyan University; and in 1884 was made secretary of the Methodist Episcopal Missionary Society. He was remarkably successful in raising large amounts of money for missionary purposes. He became a bishop of his Chuich in 1896, and in December 1902 was elected chancellor of the American University at Washington, D. C.

McCABE, James Dabney, American author. b. Richmond, Va., 30 July 1842; d. Germantown, Pa., 27 Jan. 1883. He was the son of James Dabney McCabe (1808-75), a Protestant Episcopal clergyman and writer, and was educated at the Virginia Military Institute. He began to write very early. At the beginning of the Civil War he published a pamphlet entitled 'Fanaticism and its Results, by A. Southerner' (Richmond 1860) and throughout the war he employed his pen effectively in the cause of the Confederates. Three martial plays were performed in Richmond in 1862-63 and his war-story, 'The Aide-de-Camp,' was issued in 1863. In 1863 he published a Christmas compilation called 'The Bohemian' and in 1863-64 edited The Magnolia Weekly. His war-poems were very popular, particularly 'The Sword of Harry Lee.' He wrote several biographies, including 'Life of Gen. Thomas J. Jackson' (Richmond 1863); 'Memoir of Gen. Albert S. Johnston' (1866); and 'Life and Campaigns of Gen. Robert E. Lee' (New York 1867). His other works are 'Planting the Wilderness' (Boston 1869); 'History of the Late War between Germany and France' (1871); 'Lights and Shadows of New York Life' (New York 1872); 'History of the Grange Monument,' published under the name of Edward Winslow Martin (Chicago 1874); 'Paris by Sunlight and Gaslight' (Philadelphia 1875); 'Centennial History of the United

States' (Philadelphia 1875); 'Pathways of the Holy Land' (1877); 'History of the Turko-Russian War' (1879); 'Our Young Folks Abroad' (Philadelphia 1881), and 'Our Young Folks in Africa' (1882) Besides these he was the author of several hundreds of short stories, essays and translations, and made a compilation of the romance and humor of the war called 'The Grayjackets' (1867).

McCABE, Joseph, British rationalist: b. England, 1867. He was educated at Saint Francis's, Manchester, at Saint Anthony's, Forest Gate and at the University of Louvain In 1883 he became a Franciscan, was ordained a priest in 1890 and in 1895 became rector of Buckingham College. In 1896 he left the Roman Catholic Church and became a lecturer and writer on rationalistic subjects. His books include 'Twelve Years in a Monastery' (London 1897); 'Modern Rationalism' (1897); 'Abelard' (1901); 'Saint Augustine and his Age' (1902); 'Talleyrand' (1906); 'The Martyrdom of Ferrer' (1909); 'The Decay of the Church of Rome' (1909); 'The Evolution of Mind' (1910); 'The Empresses of Rome' (1911); 'The Story of Evolution' (1912); 'Goethe' (1912); 'The Empresses of Constantinople' (1913); 'A Candid History of the Jesuits' (1913); 'The Sources of the Morality of the Gospels' (1914). George 'Bernard Shaw' (1914), 'The Soul of Europe' (1915); 'The Kaiser' (1915); 'Crises in the History of the Papacy' (1916); 'The Romance of the Romanoffs' (1917); 'The Popes and Their Church' (1918); 'A, B, C of Evolution' (1921); 'Ice Ages' (1922); 'A Century of Stupendous Progress' (1925); 'Lourdes' (1925); '40 Big Blue Books' (1927); 'The Story of the Catholic Church' (1929). Chesterton devotes a chapter to him in 'Heretics' (1909).

MACCABEES, a famous family which battled for liberty in the 2d century BC, when the Jews were persecuted by the Syrians under Antiochus IV, Epiphanes Originally applied to Judas, the third son of the aged priest Mattathias, who began the revolt, the name was widened to include the family of Judas and his followers, in due course to be applied to all wrestlers for freedom in the Greek period of Jewish history The word's origin has received various fanciful explanations, but the most probable etymology is from the Aramaic maqquaba (Judges iv, 21 and elsewhere) meaning "Hammer."

The story of the Maccabean struggle belongs to the history of the Maccabean struggle belongs

The story of the Maccabean struggle belongs to the history of heroism in all ages. When Antiochus of Syria (175-164 BC) strove to impose Hellenism in its crassest form upon the Jews under his sway and Jerusalem was overrun, while pagan rites were ordered to be substituted for Jewish, a sacrifice to Zeus being offered (168) on the Temple altar, an aged priest at Modin, Mattathias, spurned the mandate, killed the royal messenger, and destroyed the altar. Then escaping with his five sons to the mountains, he raised the standard of revolt Two years later he died, and Judas, the third son, was acclaimed leader. His skill and genius, joined to a religious fervor that was the secret of his strength, cleared away every obstacle, as he defeated in rapid succession the three Syrian generals, Apollonius, Seron and Gorgias, and later the regent, Lysias. In 165 he

reconsecrated the Temple amid the exultation of the people—the festival of Hannukkah, in memory of this restoration is still observed by the Jews of every land In 162 Lysias granted religious freedom but Judas resolved to fight on until political liberty was also attained A year later he defeated Nicanor at Adasa, but shortly afterward he fell at Elasa, while resisting Bacchides with greatly superior forces.

The command was now assumed by his brother Jonathan, who was astute enough to secure the favor of the Syrian ruler and was made high priest (153) For a time he fought for Antiochus VI, who owed his crown to Tryphon, and succeeded so well as to awaken Tryphon's jealousy He fell into his power at Ptolemais and was finally put to death (143). Simon, the last surviving son of Mattathias, became leader of the Jewish people. By his ability and force of character, he outwitted Tryphon and secured the independence of Judæa 141 he was appointed by the people hereditary leader and high priest. With him began properly the Hasmonean dynasty — the name being traced to an ancestor of the house Asamonaios (Josephus, Antiq xii, 6); according to Wellhausen (*Phar und Sadd* x, Note 94) he was the grandfather of Mattathias. The first year of his reign marked the beginning of a new era (Seleucid year 170=143-142 BC). The country enjoyed much prosperity, its resources were greatly developed and the outlook was distinctly more favorable than at any previous period since the Exile With a change of rulers in Syria, Antiochus (VII) Sidetes becoming king, Simon and two of his sons were murdered by his son-in-law who wished to curry favor with the new monarch. But the third son, John Hyrcan, escaped and succeeded to the throne, reigning 30 years with much ability. Partisan strife, however, disturbed the kingdom's peace and weakened its strength, with

the constant clashing of Pharisee and Sadducee. On the death of John Hyrcan (105), his son Aristobulus reigned for a year when his brother Alexander Jannæus became ruler (104–78), a man of considerable energy, in his persistent conflicts to extend and defend his realm. His sympathies were with the Sadducees, and once when officiating as high priest, some of the Pharisees in their anger threw at him and the attending Sadducees citrons which had been supplied for the Feast of Tabernacles As punishment, he attacked them with his troops, killing 6,000 On his death his widow, Salome Alexandra, ruled (78–69), reversing his policy and making the Pharisees her favorites, the land enjoying peace and prosperous growth. Her eldest son, Hyrcan II, who lacked capacity, was made high priest. The younger, Aristobulus, stronger and abler, coveted the succession and organized an army to conquer Jerusalem, when Alexandra died and Hyrcan was willing to retire in his brother's favor.

At this moment a new factor appeared in the person of Antipater of Idumæa who sought to further his own designs. An appeal to Rome was made. Pompey resolved to settle the matter in his own fashion, at some slight which Aristobulus offered, entered Jerusalem and made Hyrcan II high priest and ethnarch, while his brother was carried a captive to Rome. And now the Roman yoke became firmly fastened, Antipater was made procurator in 47, with his

sons Phasæl and Herod governors of Jerusalem and Galilee In 41 they became tetrarchs of Judæa In 40, Antigonus, the sole surviving son of Austobulus, was appointed king by the Parthians, in the swift changes of the day. But Herod who had escaped from prison, while his brother had committed suicide, was given the throne by the Romans (37 BC) In the same year Antigonus was put to death by Mark Aniony and the Maccabean-Hasmonean dynasty

Bibliography.—Curtiss, 'The Name Maccaof the Maccabees' (1898); Morrison, 'The Age under Roman Rule'; Streanes, 'The Age of the Maccabees'; Weiss, 'Judas Makkabeaus' (1897). Consult modern histories of the Jews, Graetz, Schurer, etc.

ABRAM S ISAACS

MACCABEES, Book of the, a name given to several Apocryphal books of the Old Testament. Of the four or five thus termed, two were declared canonical by the Council of Trent (1546), are contained in the Vulgate, and among the Apocrypha of the English Bible The three other books may be summarized Book III is found in the Septuagint but not in the Vulgate, Book IV is included in some manuscripts of the Septuagint and of Josephus Book V is merely a Syriac reproduction of the sixth book of Josephus' 'Jewish War' and is

of no historical value

First Book was the record of 40 years from the accession of Antiochus (175 BC) to the death of Simon (135 BC), and is composed after the model of the Old Testament historical style, terse, simple, and at times poetic and impassioned. The narrative is written with due proportion and in sympathetic tone. All events are dated in terms of the Seleucid era It is generally admitted that the original was in a Semitic language, most probably Hebrew, to which both Origen and Jerome bear testimony. However, it is not impossible that they were acquainted with an Aramaic version or paraphrase. The Greek translation of the Hebrew was made at an early date and has alone survived. It bears all the marks of a literal translation, preserving the Semitic and at times the Hebrew idiom. The author, to judge from the book itself, was a pious and patriotic Jew: a Palestinian, to infer from his evident familiarity with the Holy Land and his want of knowledge as to the foreign lands mentioned. An admirer of the Maccabees and their military skill, he shows the influences of his day by omitting the words "God" and "Lord" as in the book of Esther, substituting "He" and "Heaven." Owing to his omission of the dis-loyal priests, Jason and Menalaus, in striking contrast to the attitude of the Second Book, Geiger claims a Sadducee as its author, a view held by later authorities, even if Geiger's views as to its being a partisan document are not upheld Opinions differ as to its precise date-Schurer tracing it to the first or second decade of the 1st century BC, while Torrey dates it early, in the reign of Simon, a little after 135 BC. The book is one of the most vivid and valuable sources extent for Levich Living.

valuable sources extant for Jewish history.

Second Book, has a peculiar opening—two letters written by Jews of Palestine to brethren in Egypt, held by some to be spurious. The

work itself, an abridgment of five books written by Jason of Cyrene, covers Jewish history from a period a year earlier (176 BC) than its predecessor to the death of Nicanoi (161 BC) It is of special interest as picturing the situations in Palestine before the revolt of Mattathias and furnishing other data that are lacking in the First Book. The author, prob-ably a Hellenistic Jew, writes largely from the religious point of view, is a Phaisee, with a direct partisan tendency. Greek was the original language Its exact or approximate date cannot be fixed Among its characteristics are allusions to angels and spirits, to 165urrection and immortality—that the book concludes with the victory of Judas over Nicanor, indicates its aim—to arouse the Jew to observe the two Maccabean feasts, that of The incident of Dedication and of Nicanor. the mother and her seven sons, and other stories of martyrdom have given the book a value and power of its own, which appealed with special force to the Christians of the first lour centuries, as Bevan states in his 'House of Seleucus' (1902, II 175)

Third Book describes the escape of the Jews from marty dom in Alexandria in the reign of Ptolemy IV, Philopatoi (222-204 BC). It has no relation to the Maccabees, but doubtless its title was given later when all who suffered for the olden faith were called by that name It was written by an Alexandrian Jew to give courage and endurance to his brethren in Egypt In view of the fact that early Jewish settlements in the Fajum have been discovered. Both I Abrahams and A. Buchler claim the book has

Fajum—a theory that is disputed

Fourth Book has been aptly described by
Freudenthal (Breslau 1869) as a homily delivered probably on the Feast of Dedication to a Greek-speaking Jewish community. It is sermon not history, to prove how the passions can be controlled by the reason, by which term he means reason enlightened by religion and the Mosaic Law. This thesis is illustrated by many examples, notably from the Maccabean struggle A Hellenist to a certain extent, he was nevertheless an earnest, loyal Jew, eloquent and convincing. His precise date is unknown. He supplied the model for similar homilies by Christian writers in the early centuries, with their thrilling martyrdoms. In the Church the book was attributed to Josephus and added to his writings, with whose style and language it is wholly incompatible.

Without historical value is the so-called Fifth Book which Cotton gives in his 'Five Books of the Maccabees' (1832), and known also as the Arabic 'Book of Maccabees' which claims to be the history of the Jews from 186 BC. to the end of Herod's reign, but which in reality is nothing but a compilation from First and Second Books of Maccabees and Josephus The manuscript of a 'Fifth Book' which Sixtus Senensis (1566) states that he saw in Lyons and which was subsequently lost by fire, is characterized by Schurer as a "reproduction of Josephus, the style being changed for a purpose.

Bibliography.— Abrahams, I., 'J. Q. R.' (1896-97, IX, 39); Buchler, A., 'Tobiaden and

Oniaden' (Vienna 1899); Fairweather and Black, 'First Book of Macc. in Cambridge Bible Texts'; Grimm in 'Handbuch zu den Apokryphen'; Kacutzsch, 'Apokryphen'; Schurer, 'History of the Jewish People'

Abram S. Isaacs.

MACCABEES, Knights of the Modern. See MACCABEES, THE.

MACCABEES, The Ladies of the, a fraternal beneficiary association, founded in 1886, formerly the Ladies of the Modern Maccabees. Until 1914 it formed a species of auxiliary organization to the Knights of the Maccabees and the latter exercised over it a kind of guardianship. It has about 50,000 members and since its institution has distributed about \$7,000,000 in benefits and insurance.

MACCABEES, Ladies of the Modern. See Ladies of the Maccabees.

MACCABEES, The, a fraternal beneficiary association having its general offices, at the present time, in the Maccabees Building, a 15-story structure on Woodward Avenue at the Art Center in the city of Detroit, Michigan. The former title of The Maccabees was the «Knights of the Maccabees of the World,» which was changed in 1914 to the simple title «The Maccabees.»

The society was organized in the city of London, Ontario, Canada, on 20 Aug. 1878, by W. D. McLaughlan and a few other interested men. The association grew rapidly, and its subordinate lodges sprang up all over the Canadian provinces and in the states of New York and Michigan. In 1914 it united with the Knights of the Modern Maccabees, which was the original organization. In 1926 the Ladies of the Modern Maccabees also united with the association, and in 1924 the society broadened its sphere of operation by the organization of a Ladies and Junior Department, so that it has now become a family protective institution.

The association derives its name from the ancient Maccabees, a chivalrous and religious people whose history is given in the writings of the Old Testament. The leading character in the history of the ancient Maccabees was Judas Maccabeus, considered one of the most valiant soldiers and one of the greatest military leaders of all time. During the wars in which the Maccabees were engaged and in which he was their leader, he required that a portion of the fruits of all their victories should be set aside for the benefit of the widows, the orphans, the disabled, and the dependents of those who had fallen in battle. It was this particular practice and characteristic that probably suggested to Mr. McLaughlan and his co-workers the name for the new society, for this practice characterizes The Maccabees of the present day.

The organization takes applicants from the day of birth up to their 60th anniversary, and it affords all kinds and character of legal reserve life insurance, hospitalization protection, oldage homes, visiting nurse service, and general relief service to its members under all the adversities of life. The main purpose of the association is to provide social and fraternal intercourse for its members, and benefits in the way of life insurance to the families of its deceased members.

The association has, during its entire history, paid in death benefits more than \$230,000,000,

and it has paid in old-age benefits and general relief benefits under its certificates in excess of \$30,000,000. It has a large sick and accident department. The present assets of the association are in excess of \$56,000,000, and it possesses a membership of 250,000. It works under the lodge system and ritualistic ceremonies, and its form of government is thoroughly democratic, every member having a voice in the conduct of its affairs, in the making of its laws, the election of its officers, and the fixing of their compensation through representatives chosen by the direct voice of the members. The general meeting of the law-making body (The Supreme Tent as it is called), is held once quadrennially. In the interim between the meetings of its governing body, its affairs are administered by a board of nine trustees, consisting of the Supreme Commander and eight others elected by the Supreme Tent

One of the safeguards of the organization is its laws, providing that all investments must be made in municipal, state, provincial, and governmental bonds, or real estate including homes and only such real estate as has an earning capacity. The loans do not exceed 50 per cent of the appraised value of such property.

E W. Thompson,

Supreme Commander.

MACCABEES, The Woman's Benefit Association of the, an adequate rate fraternal order for women with headquarters at Port Huron, Mich Organized in 1892, as the Ladies of the Maccabees of the World, reorganized under its present name in 1915 and established in the United States and Canada, the order has 3,000 local bodies with 192,000 members and a reserve fund of \$12,000,000; provides whole life, term and disability protection; 20-year plans; junior protection for children of members; sick, last illness and burial; and maternity benefits. It maintains a free hospital service in every state for needy sick.

McCALL, Edward Everett, American jurist: b Albany, N Y, 6 Jan 1863; d. New York City, 12 March 1924 He was educated at the Albany High School and the New York University, was admitted to the bar in 1884 and practised in New York from 1884 till 1902. From that year until 1913 he was justice of the Supreme Court of New York (1st district) and Democratic candidate for mayor of New York in 1913, but was defeated by the late John Purroy Mitchel (q.v.).

McCALL, ma-kâl', George Archibald, American soldier: b Philadelphia, 16 March 1802; d. 25 Feb. 1868 He was graduated at West Point in 1822; in 1836 reached the rank of captain, and that of colonel in 1850. Having served against the Seminoles in Florida, he won distinction in the Mexican War; in 1850 he became inspector-general, resigning from the army three years later. In 1861 he was given command of the Pennsylvania Reserves, with the rank of brigadier-general of volunteers, and participated in the work of the Army of the Potomac, particularly in the Peninsular campaign of 1862, in which he was engaged with his troops at Mechanicsville, Gaines' Mill and Frazier's Farm (qq v.). At Frazier's Farm, 30 June, he was taken prisoner and was confined for several weeks in Libby prison. In August he was exchanged, but impaired health pre-

vented him from returning to the army, and in 1863 he resigned. He wrote Letters From the Frontier (1868).

McCALL, John Augustin, American insurance official: b. Albany, N.Y., 2 March 1849; d. Lakewood, N.J., 18 Feb. 1906 He was educated in his native city and served for several years as clerk in the Connecticut Mutual Life Insurance Company. In 1877 he entered the New York State insurance department in which he served as clerk, deputy superintendent and superintendent. In 1887 he was made company and in 1892 became president of the New York Life Insurance Company. In 1905 the Armstrong insurance investigation led to his resignation in 1906 and he died two months after resigning.

McCALL, Samuel Walker, American public official: b. East Providence, Pa., 28 Feb. 1851; d. Winchester, Mass., 4 Nov. 1923. In 1874 he was graduated at Dartmouth College, studied law and was admitted to the bar in 1876 and practiced in Boston. He was editor-in-cluef of the Boston Daily Advertiser in 1888-89 and served as delegate at the Republican National Conventions of 1888, 1900, and 1916. He was member of the Massachusetts House of Representatives in 1888, 1889, and 1892 and was a member of Congress from 1893 to 1913 from the 8th Massachusetts District. He was an unsuccessful candidate for the governorship of Massachusetts in 1914 but was successful the following year, being elected governor for 1916. He was re-elected for the two successive terms of 1917 and 1918. He published Life of Thaddeus Stevens (1899); Dartmouth Centennial Address on Daniel Webster (1902); The Business of Congress (1911); Life of Thomas B Reed (1914); The Liberty of Citizenship (1915), and magazine articles.

MacCALLUM, William George, American pathologist. b. Dunnville, Ontario, 18 April 1874. He was graduated from the University of Toronto in 1894 and in 1897 was graduated from the medical school of Johns Hopkins University. In 1900–08 he was associate professor of pathology, and in 1908–09 professor of pathological physiology at Johns Hopkins University. In the latter year he became professor of pathology at Columbia University, where he remained until 1917 when he returned to Johns Hopkins University as professor of pathology and bacteriology. He was a fellow of the American Association for the Advancement of Science; a member of the Association of American Physicians; the National Academy of Sciences, and an honorary member of the Society Medicorum Sverana of Stockholm, Sweden. He wrote Text-Book of Pathology (1916), and was a frequent contributor to medical journals on pathological subjects. Died Baltimore, Md., 3 Feb. 1944.

MacCAMERON, mă-kăm'er-ŏn, Robert Lee, American painter: b. Chicago, 1866; d. New York, 29 Dec. 1912. After studying in the public schools he began to make sketches for the newspapers in Chicago, and soon removed to New York, where he illustrated for newspapers and studied under William M. Chase. He then went to Paris and studied at the Beaux Arts under Gérôme and Collin. He

became a successful portrait painter and for several years before his death kept studios in London, Paris, and New York. For his Mi-Carême he received honorable mention in the Paris Salon, and in 1912 he was made a chevalier of the Legion of Honor. He was a member of several foreign and American art societies. Among his best portraits are President Taft, President McKimley, Archbishop Ryan, Justices of the Supiene Court, Hailan and Brewer, Nellie Melba, and Auguste Rodin (Metropolitan Museum, New York). MacCameron also achieved reputation for his cafés and scenes in theaters. 21 Group of Priends, also called Wormwood, painted in 1908, is in the Corcoran Gallery, Washington; the Daughter's Return, painted in 1900, is in the Metropolitan Museum, New York. Les Habtués (The Old Customers) haugs in the Wilstach Gallery, Philadelphia. He also painted a religious picture, The Last Supper, in 1909. His last work was The People of the Albyss (1912). Consult Harper's Weekly (February 1913).

McCAMMON, Joseph Kay, American lawyer: b. Philadelphia, 13 Oct. 1845; d. 2 Jan. 1907. He graduated at Princeton in 1865; studied law; became register in bankruptcy in 1870; was special counsel of the United States in Washington, 1871; president of the board for investigation of the Indian service, 1877; assistant attorney general of the United States, 1880–85, and in 1881 was appointed United States commissioner of railroads. Under Presidents Garfield and Arthur he conducted treaties with various Indian tribes. Among his writings are a Report on Indian Service (1878); Report of Councils with Bannock and Shoshone Indians (1881); Report of Councils with Flathead and Other Indians (1882); Arguments in Cases Affecting Pacific and Other Railroads.

McCARREN, ma'kar'en, Patrick Henry, American politician: b. East Cambridge, Mass., in 1849; d. Brooklyn, 22 Oct. 1909. In 1851 he removed to Williamsburg (Brooklyn, NY.) and was apprenticed to a cooper, but soon left trade and entered local politics. Before he was 21 he had been defeated for the leadership of his district. In 1881 he was elected to the New York Assembly and was re-elected in 1883 and 1887. In 1889 he was elected to the state Senate and was continuously a member of that body until his death. In 1893 he became virtually the leader of the Brooklyn Democrats. He broke with Charles F. Murphy, the leader of Tammany Hall, and from that time a bitter fight was kept up between these two politicians for the control of the Brooklyn Democrats. In 1904 one of the bitterest chapters in the history of New York politics occurred. McCarren also opposed W. J. Bryan and Charles E. Hughes. McCarren was a man of keen intellect and an aggressive fighter. He was identified with the Standard Oil Company and the American Sugar Company.

McCARTER, Margaret Hill, authoress; b. Charlottesville, Ind., 2 May 1860; d. 31 Aug. 1938. She taught in elementary schools in Indiana in 1876; graduated A.B. at the State Normal School, Terre Haute, Ind., in 1884; was principal of the High School, Rensselaer, Ind., 1884–87; held other educational positions to 1894, and was a lecturer of the State Board of

Education She married, 5 June 1890, William Arthur McCarter, DDS, of Topeka, Kan She became widely known by her fiction which is as popular in her State as that of William Allen White of Emporia Her publications include 'The Overflowing Waters' (1903); 'The Cottonwood's Story' (1903); 'Cuddy's Baby' (1907); 'The Old Quirra' (1908); 'Cuddy and Other Stories' (1908); 'The Price of the Prairies' (1910); 'The Peace of the Solomon Valley' (1911); 'Vanguards of the Plains' (1917); 'The Reclaimers' (1918); 'Paying Mother' (1920); 'Widening Waters' (1924); 'The Candle in the Window' (1925).

McCARTHY, D'Alton, Canadian politician b near Dublin, Ireland, in 1836; d Canada, 11 May 1898 He was the son of an Irish barrister who found a home for his family on the shores of Kempfendfeldt Bay, Ontario, after a six weeks' voyage in a sailing vessel. Educated at the Barrie Grammar School, he studied law and was called to the bar in 1858 In 1872 he was made queen's counsel, and attained high rank both in jury cases and appeal cases In 1876 he was elected to the House of Commons as a Conservative and held this seat until his death, which was occasioned by a railway accident. He seceded from the Conservative party and aided the Liberals in opposing special legislation in the interest of Roman Catholic education. He was for a time president of the Canadian branch of the Imperial Federation League and a member of the Council of the British Empire League Consult 'The Late D'Alton McCarthy, QC, MP., an Appreciation, by Amicus, Canadian Magazine (May 1903)

MacCARTHY, Hamilton Thomas, Canadian sculptor: b. London, England, 1847. He studied under his father and in Europe, and in 1885 removed to Canada. He lived in Toronto until 1898, when he took up his residence in Ottawa. He was distinguished for his capacity for expressing contemporary thought. The Royal Canadian Academy elected him a member in 1890 and councillor in 1906. Among his works are 'Burns and Highland Mary' (1877); the statue of Sir John H. Macdonald in Toronto; the bronze monuments for the South African War in Halifax, Ottawa, Charlottetown, Quebec and Brantford. D. 24 Oct. 1939,

McCARTHY, ma-kar'thi, Justin, Irish author and politician: b Cork, Ireland, 22 Nov. 1830; d 24 April 1912 He became connected with the Liverpool press in 1853 and in 1864 was made editor-in-chief of the Morning Star. He sat in Parliament as a Home Ruler from 1879–1900 and was chairman of the Irish Parliamentary party 1890–96 His stay in the United States extended from 1868 to 1870, during which period he was some time connected editorially with the New York Independent His main work is 'History of our Own Times' (1879–80), which, rejected by one publishing house, made a fortune for the firm that produced it as well as for the author. He also wrote 'History of the Four Georges' (1889), and his novels include 'Lady Judith' (1871); 'A Fair Saxon' (1873); 'Dear Lady Disdain' (1875); 'The Right Honorable' (1886, with Mrs. Campbell-Praed); 'The Story of Gladstone's Life' (1898); 'Modern England' (1898).

'Reminiscences' (1899); 'The Reign of Queen Anne' (1902), and 'The Story of an Irishman' (1904).

McCARTHY, Justin Huntly, Irish journalist and author b. 1860 He was graduated at University College and from 1884-92 was member of Parliament. He was a prolific and versatile author, following in the footsteps of his father, Justin McCarthy (qv) Among his works are 'Outline of Irish History' (1883), 'Serapion, and Other Poems' (1883); 'England Under Gladstone' (1884), 'Camiola, a Girl with a Fortune' (1885); 'History of the French Revolution' (1897); 'Short History of the United States'; 'The Dryad' (1905) He also wrote plays, such as 'The Candidate'; 'The White Carnation'; 'If I Were King,' and 'Stand and Deliver.' D. 21 March 1936.

McCAUL, ma-kâl', John, Canadian scholar: b. Dublin, Ireland, 1807; d 1880 He was appointed president of Toronto University in 1848 and was prominent for many years in educational matters in Canada He edited Horace, Longinus, Lucian and Thucydides as college textbooks, and among his valuable archæological works are 'Britanno-Roman Inscriptions' (1863), and 'Christian Epitaphs of the First Six Centuries.'

MacCAULEY, ma kâl'ĭ, Clay, American Unitarian clergyman and author: b Chambers-Unitarian clergyman and author: b Chambersburg, Pa, 8 May 1843. He was graduated at Princeton in 1864 and at the Theological Semnary of the Northwest, Chicago, in 1867, and lead philosophy and divinity at Heidelberg, 1873. In the Civil War, 1862–63, he was a lieutenant in the 126th Pennsylvania regiment, and served on the staff of Gen. S. D. Sturgis, and in 1864-65, was a member of the Christian. and in 1864-65 was a member of the Christian Commission in the United States army In 1880-81 he was a collaborator of the Bureau of Ethnology among Indians east of the Mississippi Entering the Unitarian ministry he was pastor of the First Church, Waltham, Mass., 1869-72, and of All Souls Church, Washington, D C, 1876-81 From 1890 to 1900 and again after 1909 he served as director of the Japan mission of the Unitarian Association, and from 1891 to 1899 was president of the College for Advanced Learning at Tokio and professor there of philosophic and historic theology. He lectured on Japan in 1904-09. He wrote 'Christianity in History' (1891); 'The Religious Problem of Japan—How to Solve It' (1894); 'Inlem of Japan—How to Solve It' (1894); 'Introductory Course in Japanese' (1896; 1905); 'Japanese Literature' (1899); 'A Day in the Very Noble City, Manila' (1899), and published 'Single Songs of a Hundred Poets' (1899) and other translations from the Japanese; 'Florida Seminoles' (1884); 'Present Religious Condition of Japan' (1902); 'Unitarian Mission to Japan' (1909); 'A Daughter of the Samurai' (1910); 'Thought and Fact for To-day,' also in Japanese (1911); 'The Memorial Most Worthy of Our Patriot Dead' (1911); 'The English Language in the New Georgean Era' (1911); 'Charles Dickens: An Appreciation' (1912); 'The Faith of the Incarnation' (1913); 'Memories and Memorials' (1914); 'The American-Japanese Problem as a Race Question' (1915), and contributions to periodicals in (1915), and contributions to periodicals in Japan and the United States. He died 15 Nov.

McCAUSLAND'S RAID, an incursion of the Confederate general McCausland into Maryland and Pennsylvania, the chief incident of which was the burning of Chambersburg, Pa. General Early having defeated General Crook in the battle of Kernstown (qv.), 24 July 1864, and driven him and Averell across the Potomac at Williamsport, ordered General McCausland with his brigade and that of Bradley T. Johnson, with four guns, in all about 2,500 men, across the Potomac to raid Pennsylvania and then move to Cumberland, Md, to destroy the machinery of the Cumberland coalpits and the repair shops, stations and bridges of the Baltimore and Ohio Railroad Early says he wished to open the eyes of the people of the North to the enormities of its armies, by an example in the way of retaliation, and that Chambersburg, Pa, was selected as the town on which retaliation should be made. The sum of \$100,000 in gold, or \$500,000 in currency was to be demanded of it, in default of which McCausland was ordered to burn the town Under cover of demonstrations at Williamsport and other points along the Potomac, McCausland crossed the river at McCoy's Ferry, near Clear Spring, above Williamsport, on the 29th, and made straight for Chambersburg, about 25 miles northeast. He met with but little opposition and, on the morning of the 30th, rode into the fated town and demanded the sum fixed by Early. It could not immediately be raised; he knew that General Averell was close upon him. and setting fire to the place, laying a greater part of it in ashes, he hastily marched westward to McConnellsburg and encamped Averell, who was in Hagerstown when he heard that Mc-Causland had crossed the Potomac, started in pursuit with about 2,600 cavalry, went through the burning town and, a few miles from Mc-Connellsburg, struck McCausland's rear, diverting him from his intended march on Bedford and forcing him back to the Potomac at Hancock, which was reached by noon of the 31st Here McCausland formed for battle, but upon Averell's appearance and prompt attack he withdrew westward by the National road to Cumberland, where, 1 August, he found General Kelley to oppose him, whom he attacked in the afternoon, and skirmished until night, when he retreated toward Old Town, on the Potomac, leaving 30 of his killed and wounded on the field. At Old Town he forced a crossing at daylight 2 August, capturing or dispersing a regiment of new troops from Ohio, and then moved south into the valley of the south branch of the Potomac, by way of Springfield and Romney. From Romney, 4 August, he moved to New Crosle and the debt of the south branch of the Potomac, by way of Springfield and Romney. moved on New Creek and attacked the garrison, but after a stubborn fight was repulsed, leaving 25 dead on the field, the Union loss being 36 killed and wounded. McCausland then withdrew to near Moorefield, where the south fork joins the south branch of the Potomac, and considering himself safe from pursuit went into camp. Averell, who had remained at Hancock when McCausland drew off toward Cumberland, crossed the Potomac on the 4th, and, after a forced march through Bath, Springfield and Romney, before sunrise of the 7th surprised McCausland in his camp and routed him, capturing his four guns, nearly all his wagons, several hundred horses, three battle-flags, many small arms and 420 prisoners, including 38

officers McCausland's loss in killed and wounded was about 100. Averell's loss was 41 killed and wounded McCausland's shattered command fled to the mountains and made its way in squads to the Shenandoah Valley, finally assembling at Mount Jackson "This affair," says Early, "had a very damaging effect upon my cavalry for the test of the campaign." Consult 'Official Records' (Vols. XXXVII, XLIII); Pond, 'The IShenandoah Valley in 1864'; Early, 'The Last Year of the Wai for Independence'

MacCHESNEY, mak-che'ne, Clara T., American artist: b. Brownsville, Cal., 1861; d. 6 Aug 1928 She studied at the San Francisco Art School, at the Gotham Art School, New York, and at the Colarossi School in Paris. Her genre work received favorable recognition. At the World's Columbian Exposition in 1893 she was awarded two medals and she received the Dodge Prize, New York, in 1894. Later she also received three medals from the Colarossi School, a gold medal from the Philadelphia Art Club and the second Hallgarten prize from the National Academy of Design, New York At the Paris Exposition of 1900 she exhibited 'Pomegranates' and 'The Old Blind Fiddler.'

MacCHESNEY, Nathan William, American lawyer, publicist and writer b. Chicago, Ill., 2 June 1878 He studied at Chicago University, and graduated from the Law School of the University of Michigan in 1902 He practiced in Chicago, and was a member of many important legal, civic and political boards and organizations. From 1911–17 he served as Judge Advocate General of Illinois, and during the World War was employed in many important legal capacities. From 1924 he was consulgeneral for Siam. His writings include: 'The Military Policy of the United States'; 'Principles of Military Law'; 'Principles of Real Estate Law'; 'Challenge to American Ideals.'

MACCHIAVELLI, Niccolo. See Machiavelli, Niccolo.

McCHORD, mä-kôrd, Charles Caldwell, American lawyer: b. Springfield, Ky., 3 Dec. 1859 He was educated at Centre College (now Central University), Danville, Ky, and was admitted to the bar in 1882, engaging in practice at Louisville, Ky. He was a member of the law firm, McChord, Hines and Norman, until 1911. He was prosecuting attorney of Washington County, Ky., in 1886–92, and was chairman of the Kentucky Railroad Commission in 1892–95 and in 1899–1907 He served in the Kentucky senate in 1895–99 and introduced the railroad rate bill enacted by the legislature. He was president of the National Association of Railroad Commissioners in 1906–07, and in 1910–26 was a member of the Interstate Commerce Commission, resigning in 1926 to resume his law practice.

McCLAIN, ma-klān, Emlin, American jurist: b Salem, Ohio, 26 Nov. 1861; d 25 May 1915. He was graduated at the State University of Iowa in 1871, later studying law there, and until 1881 he practised law in Des Monnes. He was appointed professor of law at the University of Iowa in 1881 and was subsequently vice-chancellor and chancellor there. He served as judge of the Supreme Court of Iowa in 1901–12, and was its chief justice in 1906–12.

From 1913 until his death he was professor of law at the Leland Stanford, Jr, University. He was a contributor to the 'American Encyclopedia of Law and Procedure, wrote extensively for the law magazines and was author of 'McClain's Annotated Statutes of Iowa' (1880); 'A Treatise on Criminal Law as Now Administered in the United States' (1897); 'Constitutional Law in the United States' (1905, 2d ed, 1910), etc.

McCLELLAN, ma-klěl'an, George Brinton, American soldier: b Philadelphia, 3 Dec. 1826, d Orange, N. J., 29 Oct 1885 He was educated at the University of Pennsylvania and at West Point where he was graduated in 1846. He was brevetted second lieutenant of engineers and immediately ordered to Mexico, where as lieutenant of a company of sappers, miners and pontoniers he rendered valuable service. He was at the siege of Vera Cruz, at Cerro Gordo and in the attack on the City of Mexico, at Contreras and Churubusco he won the brevet of first lieutenant and was brevetted captain for gallantry at Chapultepec the war he was ordered to West Point as captain of field labors and instructor in bayonet exercise. In 1851 he was ordered to Fort Delaware to superintend its construction. The next year he accompanied Capt. Randolph B Marcy The next (later his father-in-law) on an expedition to explore the Red River, and in September 1852 was ordered as senior engineer to Texas, to survey the rivers and harbors of that State. In 1853 he was detailed for the examination of the western part of the proposed route for a Pacific railroad; and explored the Yakima Pass and various portions of the Cascade Range, and the most direct route to Puget Sound, his report forming the first volume of the 'Pacific Rail-road Surveys' published by the government. He was soon afterward detailed to investigate the railroad system of the United States, with a view to obtain all the necessary data on construction, equipment and management for the successful operation of the Pacific railroad Of the result of his proceedings he presented a full report in November 1854 In March 1854 he was promoted to captain in the 1st Cavalry. In the spring of 1855 he was sent to Europe to study the organization of European armies and observe the war in the Crimea. He wrote one volume of the report of the commission, which was republished in Philadelphia under the title of 'The Armies of Europe' (1861). He resigned his commission in January 1857, and was for three years vice-president and engineer of the Illinois Central Railroad, at the end of which time he became general superintendent of the Ohio and Mississippi Railroad, and two months later president of the eastern division of the same road. He held this office when the Civil War broke out in 1861. He then received a commission as major-general from the governor of Ohio and proceeded to organ-ize the volunteers of the State; the States of Ohio, Illinois, Indiana, the western part of Pennsylvania and western part of Virginia were united to form the Department of the Ohio under his command About 1 June his Ohio under his command About 1 June his army began to cross the Ohio River into Virginia; on the 18th McClellan himself left Cincinnati to take the field, and by the middle of July the whole northwestern part of the State had been cleared of Confederate troops and the Wheeling legislature left free to organize a

loval government

On 22 July, McClellan was summoned to Washington to take command of the Army of the Potomac, and commissioned as major-general of the United States army On his arrival at Washington he found everything in disorder and the troops badly demoralized in consequence of the defeat at the first battle of Bull Run, and devoting himself to the organizing and disciplining of his army, he soon brought order out of chaos and had his troops well equipped and in excellent condition. On the retirement of General Scott from active service, McClellan was appointed general-in-chief of the armies of the United States Plans were then taken under discussion for an attack upon Richmond, and here difference of opinion arose between the President and the Secretary of War and Mc-Clellan; the plan finally accepted made the base of supplies on Chesapeake Bay, with line of march upon Richmond from the Peninsula. The army did not move until March 1862, and in the meantime discontent had arisen at Wash-On 10 March ington on account of the delay the army advanced toward Manassas, but as the Confederates had evacuated that place and had fallen back upon Richmond, the real campaign was begun by transporting the troops to Fortress Monroe. On 11 March, some two weeks before leaving Washington, McClellan was deprived of the chief command, leaving him the command of only the Army of the Potomac; McDowell's corps and other reinforcements on which he had relied were also removed from his army for the defense of Washington He besieged Yorktown for a month, though opposed by a much inferior Confederate force, whose numbers he greatly overestimated; when Yorktown was evacuated 4 May, he advanced toward Richmond, defeating the Confederates at Williamsburg and Hanover Court House. After reaching the Chickahominy, he found his lines too extended to protect from attack and advance upon Richmond, and decided to retreat to the James River; then followed the Seven Days' Battles which ended when the Federal forces reached Hampton's Ferry. From here McClellan had planned a new advance, but dissatisfaction against him was so strong that he was relieved of his command and ordered to evacuate the Peninsula (See Peninsular CAMPAIGN) He was then put in command of the fortifications of Washington, till after the second battle of Bull Run, when he succeeded General Pope, again taking command of the Army of the Potomac On Lee's invasion of Maryland, McClellan marched to attack him and fought the battle of Antietam (q v), forcing the Confederates to retreat from their position and following them as far as the Potomac. He did not, however, cross the Potomac in pursuit, as he was awaiting supplies; this failure to follow up his victory caused him to be deprived of his command and he was or-dered to Trenton, N. J. He took no further part in the war.

In 1864 he was Democratic nominee for President of the United States, and was defeated, the electoral vote stood 212 for Lincoln against 21 for McClellan, but McClellan's popular vote was 1,800,000. He remained abroad from 1864-68, and on his return had charge of the construction of the Stevens' floating battery.

which, however was not completed on account of financial difficulties In 1870 he was appointed chief engineer of the department of docks for New York City, in 1877 he was elected governor of New Jersey, and during his administration reduced and finally abolished the state tax, improved the system of public education and built up an effective militia; he declined a renomination. As a general, McClellan won the confidence and aroused the enthusiasm of his soldiers to an unusual degree; he excelled as an organizer of armies and had a thorough knowledge of the science of tactics, as shown in his plans of campaign, but in actual campaigning lacked aggressiveness and the power to act quickly and take advantage of his enemy's mis-takes. He wrote besides the reports mentioned takes. He wrote besides the reports mentioned 'Manual of Bayonet Exercise' (1852) and 'Report on the Organization and Campaigns of the Army of the Potomac' (1864). Consult 'McClellan's Own Story,' edited by W. C. Preme (New York 1887); Michie, P. S., 'General McClellan' (in 'Great Commander' series ib. 1901); Rhodes, J. F., 'The Frist Six Wecks of McClellan's Peninsular Campaign' (Boston 1896); Ropes, J. C., 'Story of the Civil War' (Vol. II, New York 1895); Webb, A. S. 'Peninsula: McClellan's Campaign of 1862' (ib. 1881), and Bradford, Gamaliel, 'Union Portraits' (in Atlantic Monthly Vol. CXIV, Boston 1914).

McCLELLAN, George Brinton, American publicist and public official: b Dresden, Germany (where his parents were on a visit), 23 Nov. 1865; d. Washington, D. C., 30 Nov. 1940. He was the son of Gen. George B. Mc-Clellan (q.v.), and was graduated from Princeton, A.B. in 1886; A.M. in 1889. Taking up journalism, he was a reporter on the staffs of several New York City dailies, and from 1889-92 was treasurer of the Brooklyn Bridge, then a toll structure. In the meantime, he studied law and was admitted to the bar in 1892. In 1893 Richard Croker, then boss of Tammany Hall, picked the youthful «silk-stocking» as window dressing for his municipal ticket and made him president of the New York City Board of Aldermen. In 1894 he was elected to Congress and served as a member thereof continuously until 1903, when Charles F. Murphy, then the Tammany boss, capitalized the McClellan brains and respectability to defeat Seth Low for a second term as mayor of Greater New York. Two years later Murphy again lined up his forces behind Mr. McClellan as the only means of keeping William Randolph Hearst out of the City Hall. But there was trouble brewing. Mr. McClellan had fought vice and gambling, and otherwise had given offense to Murphy and his following. In January 1906 he committed political suicide by asserting: «As a Democrat and as mayor of this town, I am unalterably opposed to Charles F. Murphy and everything he stands for." He retired from politics in 1909 at the end of his second term, but he left behind a record for efficiency and honesty that forms one of the few bright pages in New York officialdom of that era. As mayor he initiated many outstanding municipal projects including the Catskill water supply, the Queensboro and Manhattan bridges, and the Municipal Building. Mr. McClellan was made honorary chancellor of Union University in 1906, and was Stafford Little lecturer on public affairs at Princeton, 1908-10; university

lecturer on public affairs, 1911–12; professor of economic listory at Princeton 1912–31; ementus thereafter During the World War he served overseas as heutenant colonel. He was a member of numerous societies and published 'The Oligarchy of Venice' (1904); 'The Heel of Wai' (1915); 'Venice and Bonaparte' (1931); 'Modern Italy' (1933); also numerous magazine articles. He received the honorary degree of LL D from Princeton and Fordham universities in 1905 and from Union University in 1906. In 1889 he married Miss Georgianna L. Heckscher, daughter of John G. Heckscher and mece of August Heckscher. Mr. McClellan traveled extensively, and after leaving Princeton lived in Washington. His collection of Meissen porcelain is famous.

McCLERNAND, John Alexander, American lawyer: h. Breckmidge County, Ky., 30 May 1812; d. Springfield, Ill., 20 Sept. 1900. He was admitted to the Kentucky bar in 1832, but in the same year volunteered for military service against the Sac and Fox Indians. Five years later he was elected to the Illinois legislatine, and subsequently sat for two terms in Congress. During the Civil War he served with distinction at the battle of Fort Donelson, was brigadier general of volunteers, and was promoted major general. He led a division at the battle of Shiloh, relieved Sherman before Vicksburg in 1863 and was in command of the 13th Army Corps until 1864, when he resigned. In 1870 he was appointed circuit judge for the Sangamon, Ill., district. He presided at the National Democratic Convention in Saint Louis, 1876, and was appointed by President Cleveland member of the Utah Commission.

MACCLESFIELD, māk'k'lz-fēld, England, market town and municipal borough in Cheshire, 166 miles northwest of London, on the river Bollin and on the London, Midland and Scottish and the London North Eastern railways. In the Domesday Survey it is recorded as part of the estate of the Earl of Chester and is reputed to have become a free borough in the beginning of the 13th century. The first recorded charter, however, dates from 1261. The church of Saint Michael was founded in 1278 and was partially rebuilt and considerably enlarged in 1740. A commercial school was erected in 1840 from the funds of the free grammar school founded in 1502. There are slate and stone quarries in the vicinity and brewing is carried on; but the chief manufactures of the town are in silk and cotton textiles. The first silk mill was set up in 1755, while the manufacture of cotton was begun in 1785. The town has modern water and gas works, an insane asylum, public library, parks, baths and markets, Pop. about 34,797.

McCLINTOCK, Emory, American actuary: b. Carlisle, Pa., 19 Sept. 1840; d. 10 July 1916. He was graduated from Columbia University in 1859, and afterward took special studies in chemistry. He was tutor in mathematics at Columbia 1859-60. He was consular agent at Bradford, England, 1863-66, actuary of the Asbury Life Insurance Company, New York, 1867-77, and of the Northwestern Mutual Life Insurance Company, Milwaukee, 1871-89. From 1889 to 1911 he was actuary of the Mutual Life Insurance Company, New York, of which he was vice-president in 1905-

11, trustee after 1905 and consulting actuary after 1911. He was president of the American Mathematical Society in 1890-94 and of the Actuarial Society of America in 1895-97. He was a Fellow of the American Academy of Arts and Sciences and Fellow of the Institute of Actuaries, London. He contributed to mathematical journals.

McCLINTOCK, SIR Francis Leopold, English admiral b Dundalk, Ireland, 1819; d. 17 Nov. 1907 He entered the British navy in 1831 and was commissioned lieutenant in 1845. He sailed on four Arctic voyages, being sent out in 1848 to search for Sir John Franklin, and again in 1850 and 1852, without discovering any traces of the explorer In 1857 he renewed the search as commander of the Fox and brought back documentary and other evidence of Franklin's death For his services as an Arctic explorer he was knighted in 1860, and in 1884 made admiral He wrote 'Voyage of the Fox' (1859).

McCLINTOCK, John, American scholar: b Philadelphia, Pa, 27 Oct 1814; d Madison, N Y, 4 March 1870 He was graduated at the University of Pennsylvania in 1835 He entered the ministry of the Methodist Episcopal Church and from 1836 to 1851 was professor of mathematics and of Greek and Latin in Dickinson College From 1848 to 1856 he edited the Methodist Quarterly Review He was delegate to several conferences abroad and in 1857 became pastor of Saint Paul's Church, New York Three years later he was appointed preacher of the American Chapel in Paris He advocated the Union cause in the Civil War, and after his return to America in 1864 was again pastor of Saint Paul's, New York, but failing health compelled his resignation and he retired to Germantown, Pa He removed to New Brunswick, N. J, in 1866 and became chairman of the Central Centenary Committee of the Methodist Episcopal Church. For the last three years of his life he was president of the Drew Theological Seminary He was joint editor and compiler with James Strong of the 'Cyclopedia of Biblical, Theological and Ecclesiastical Literature' which goes by their name, the last volume of which was published in 1895. Among his other works are 'An Analysis of Watson's Theological Institutes (1850); and 'Temporal Power of the Pope' (1853). He also issued a translation of Neander's 'Life of Steed a translation of Neander's 'Life of Christ' (1847); 'Sketches of Emment Methodist Ministers' (1863); a translation of Bungener's 'History of the Council of Trent' (1851); 'Living Words,' sermons (1871) and 'Lectures on Theological Encyclopædia and Methodology' (1873) Consult the 'Life' by Carolia (New York 1875) Crooks (New York 1876).

McCLOSKEY, ma-klös'kĭ, John, American Roman Catholic prelate: b Brooklyn, N Y, 20 March 1810; d. New York, 10 Oct. 1885. His secondary and collegiate studies were made at Mount Saint Mary's College, Emmitsburg, Md. and his post-graduate studies in France and Rome At 24 he was ordained priest and on returning to America was assigned to Saint Joseph's Church, New York City. When Saint John's College, at Fordham (now a part of New York City), was opened in 1841, he was made its first president, but in the next year he returned to parish work. In 1844 he was ap-

pointed coadjutor to Bishop Hughes of the diocese of New York, and consecrated titular bishop of Axiere, and three years later was appointed bishop of Albany, a diocese just created from a part of the diocese of New York. For 17 years he worked for the upbuilding of the Albany diocese and the good of his people. He built the cathedral of the Immaculate Conception at Albany, Saint Joseph's Theological Seminary at Troy, established several new parishes and founded educational and charitable institutions, including hospitals, orphanages, homes for the aged and reformatories. He succeeded Archbishop Hughes in the archiepiscopal see of New York, 6 May 1864. The result of his labors in the archdiocese of New York remains his greatest monument. He was made a cardinal in 1875, under the title of Santa Maria supra Minervam He was in attendance at the Vatican Council (qv) and a member of the committee on discipline He was summoned to Rome February 1878 to attend the conclave for the election of a Pope but was too late to cast a vote, Leo XIII having been elected a few hours before his arrival. Cardinal McCloskey was noted for his gentleness, firmness, profound scholarship and great executive ability Consult 'The Life of John Cardinal McCloskey, First Prince of the Church in America 1810-85?

McCLOSKEY, William George, American Roman Catholic prelate b Brooklyn, N Y., 10 Nov 1823, d 17 Sept. 1909. Upon completing his studies at Mount Saint Mary's College, Emmitsburg, Md, he turned to the law, but subsequently entered Saint Mary's Theological Seminary, where he pursued a six years' course in philosophy and theology, being or-dained priest 6 Oct 1852 His first appointment was as assistant in the church of the Nativity In 1853 he was named professor of Latin and Sacred Scriptures in Mount Saint Mary's College and in 1857 became director of the theological seminary When the American College was formally opened in Rome Pope Pius IX chose Dr. McCloskey its first president, 8 Dec. 1859, a position which, for eight years, he filled to the utmost satisfaction. In 1865 he visited America in the interests of the institution under his charge and succeeded in collecting funds sufficient for its permanent endowment Upon the death of Bishop Lavialle, Pope Pius IX appointed Dr. McCloskey to the see of Louisville, Ky., and he was consecrated at Rome 24 May 1868 During his 36 years' administration numerous churches, schools and religious institutions were built throughout his diocese.

McCLUNG, mä-klung', Clarence Erwin, American zoologist: b. Clayton, Calif., April 5, 1870; d. Swarthmore, Pa, Jan 17, 1946. He was graduated at the University of Kansas in 1892, later studying at Columbia University and the University of Chicago. A member of the faculty of the School of Medicine at the University of Kansas in 1897–1913, he then became professor of zoology and director of the zoological laboratory at the University of Pennsylvania. He was internationally known for his extensive studies on chromosomes and headed scientific expeditions to Oregon, Washington, and western Kansas. He wrote articles on the cretaceous fish of Kansas, and was managing editor of the Journal of Morphology.

McCLURE, ma'kloor', Alexander Kelly, American journalist: b Sherman's Valley, Perry County, Pa, 9 Jan 1828; d. 1909 He was rearred on a farm, educated at home and apprenticed to a tanner in 1842, soon after began to write for the Perry Freeman and edited and published the Junata Sentinel at Millin, Pa, in the Whig interest, 1846-50 He then published (1850-56) the Chambersburg Repository, which he made influential in the cause of anti-slavery. He was State superintendent of printing in 1855; a member of the State convention of 1855 which met at Pittsburgh to organize the Republican party; in 1856 was admitted to the bar and was a delegate to the first Republican National Convention in Philadelphia. In 1857-58 he sat in the legislature as a Republican and was State senator in 1859. As leader of the Pennsylvania delegation in the Republican National Convention of 1860 he aided in the nomination of Abraham Lincoln. In 1862-64 he again published the Chambersburg Repository, and in the latter year served as assistant adjutant-general in charge of the draft in Pennsylvania. Two years later he was again a member of the legislature, and in 1868-73 practised law in Philadelphia. He was chairman of the State delegation to the Liberal Republican Convention in 1872, and of the Liberal Republican State Committee, and in that year entered the State senate In a close election in 1873 he was defeated as an independent candidate for mayor of Philadelphia In 1875 he established the Philadelphia Times, of which he was editor-in-chief till 1901 He published 'Three Thousand Miles Through the Rocky Mountains'; 'Our Presidents and How We Make Them' (1901); 'Recollections of Half a Century' (1902); 'Old Time Notes of Pennsylvania' (2 vols, 1906), etc.

McCLURE, James Gore King, American Presbyterian clergyman: b. Albany, N. Y., 24 Nov 1848 He was graduated at Yale in 1870, at the Princeton Theological Seminary in 1873 and ordained as a Presbyterian minister in 1874. He was settled (1874-79) at New Scotland, N. Y, and at Lake Forest, Ill., 1881-1905. From 1897 to 1901 he was president of Lake Forest University. In 1905-28 he was president of McCormick (now Presbyterian) Theological Seminary, Chicago. He has written 'The Man Who Wanted to Help' (1897); 'The Great Appeal' (1898); 'Environment' (1899); 'For Hearts that Hope' (1900); 'A Mighty Means of Usefulness' (1901); 'Living for the Best' (1903); 'The Growing Pastor' (1904); 'Loyalty, the Soul of Religion' (1905); 'Supreme Things' (1907), etc.

McCLURE, Sir Robert John Le Mesurier, English vice-admiral: b. Wexford, Ireland, 28 Jan. 1807; d London, 17 Oct 1873 He began his naval career in 1824, and in 1836 under Sir John Ross made his first voyage to the Arctic regions. Again he joined an expedition sent to discover the Northwest Passage in 1848, that of Sir James Clark Ross Two years later he was placed in command of a Franklin search expedition, discovered Prince of Wales Strait which connects the Atlantic and Pacific and thus accomplished one object of the expedition, the discovery of the Northwest Passage. He was forced, however, to abandon his ship, and completed the Northwest Passage by land. On his

return he was knighted From his journals was published 'The Discovery of the Northwest Passage' (by Capt Sherard Osborne, 1856).

McCLURE, Samuel Sidney, American editor and publisher b Frocess, County Antrim, Ireland, 17 Feb. 1857. He was graduated at Knox College, Galesburg, Ill., in 1882. In 1882. 83 he was editor and manager of the Wheelman for the Pope Manufacturing Company, and m the following year was connected with the De Vinne Press, New York In 1884 he established a newspaper syndicate which has grown to great proportions and assumed distinctive importance in the publishing world. In 1893 he founded McChire's Magazine, which through his able administration soon stood in the front rank of American periodicals 1899 he established the publishing house of McClure, Phillips and Company, New York, and was its president until the business was acquired by Doubleday, Page and Company The magazine was taken over by the McClure Publications, Incorporated. Struce 1893 Mr McClure has been president of the S. S. McClure Company and since 1894 he has been a trustee of Knox College Consult Mr. McClure's very in-teresting 'My Autobiography' (New York 1914)

McCLURG, ma-klooig', Alexander Caldwell, American publisher: b Philadelphia, 1834; d Saint Augustine, Ela, 15 April 1901. He was graduated at Miami University, Oxford, Ohio. in 1853, engaged in business with S C Grigge and Company, publishers, in Chicago and in 1862 entered the Union army. He was captain in the 88th Illmos regiment of infantry, rose to the rank of colonel, was made brevet brigadier-general, and in the Atlanta campaign and during Sherman's great march served as chief of staff to the 14th corps. Returning from the war, he was admitted to partnership in the publishing house above mentioned, and some years later established the firm of Jansen, Mc-Clurg and Company, afterward A. C. McClurg and Company The business of the house prospered, and in 1899 the company was reorganized, the co-operative principle adopted and the employees, among whom the stock was largely distributed, were granted easy terms for increasing their investments.

McCLYMONT, măk-klī'mont, James Alexander, Scottish theologian: b. Girvan, Ayrshire, 26 May 1848 He was educated at the universities of Edinburgh and Tübingen, entered the ministry and in 1874-1913 he was in charge of Holburn Church, Aberdeen, when he retired. He was a member of the general committee of the Church of Scotland, and was a chaplain in the territorial force, retired with the rank of colonel. He collaborated in translating Beck's 'Pastoral Theology of the New Testament' and was author of 'The New Testament and its Writers' (1892; 2d ed., 1893); 'The Church of Scotland' (1893); 'New Testament Criticism' (1913), etc. He died 19 Sept. 1927.

MacCOLL, ma-kŏl', Evan, Canadian poet; b Kenmore, Argyleshire, Scotland, 21 Sept. 1808; d Toronto, 1898. He emigrated to Canada in his 42d year and became known as the poet of the Scottish colony at Kingston He wrote with fluency in Gaelic and his 'Clàreach nam Beann' created much enthusiasm among

his compatriots. He is also author of many English poems, such as 'My Rowan Tree'; 'The Mountain Minstrel' (1887); and 'Poems and Songs' (1888)

MacCOLL, Malcolm, British theologian and author b Glenfinan, Inverness-shire, Scotland, 27 March 1831; d London, 5 April 1907 He studied at Trinity College, Glenalmond, and at the University of Naples and was ordained in the Scottish Episcopal m' istry in 1857 He filled curacies at different London churches, was chaplain to the British Ambassador at Petrograd in 1862-63, in southern Italy in 1867-69, and at Addington, Bucks. His hearty support of Gladstone won for him in 1871 recognition in the form of the living of Saint George's, Botolph Lane, and he was further rewarded with a canonry at Ripon in 1884. He was a keen controversialist in both ecclesiastical and political fields, and was actively engaged in newspaper and pamphlet writing in support of High-Church doctrines and of Gladstone's Irish policy He traveled extensively and was prominently concerned with the airing of Bulgarian and Armenian affairs after a visit in those countries in 1876 Author of 'Mr. Gladstone and Oxford' (1865); 'Lawlessness, Sacerdotalism and Ritualism' (1875); 'Reasons for Home Rule' (1886, nine eds); 'The Reformation Settlement' (10th ed, 1901), 'The Royal Commission and the Ornaments Rubric' (1906), etc.

McCOMB, mă-kōm, John, American engineer and architect: b New York, 17 Oct. 1763; d. there, 25 May 1853 He became prominent for his designs for both public and private buildings in New York, Philadelphia and the Eastern States. He designed the front of the old government house in New York in 1790, Saint John's Church, and was supervising architect of the city of New York at the time of the erection of the city hall

McCOMB, Miss, city in Pike County; 78m. S. of Jackson, on the Illinois Central Railroad. It has railroad shops and cotton, rayon and silk mills. Pop. (1940) 9,898.

McCOMBS, William Frank, American lawyer: b. Hamburg, Ark., 26 Dec. 1875; d. 22 Feb. 1921. He was graduated at Princeton in 1898 and at the Harvard Law School in 1901. He practiced in New York City, and as chairman of the Democratic National committee in 1912-16 he managed the first campaign of Woodrow Wilson for President. He declined the ambassadorship to France in March 1913.

McCONNELL, ma-kŏn'ĕl, Francis John, American Methodist-Episcopal bishop: b. Trinway, Ohio, 18 Aug 1871 He was educated at the Ohio Wesleyan University and entered the ministry in 1894. He held pastorates in Massachusetts at West Chelmford; Newton Upper Falls; Ipswich; Haward street, Cambridge; and at New York avenue, Brooklyn In 1909—12 he was president of De Pauw University, and in 1912 he was elected bishop. Author of 'The Divine Immanence' (1906); 'The Preacher and the People' (1922); 'Is God Limited?' (1924); 'The Christlike God' (1927).

McCONNELL, Samuel D., American Protestant Episcopal clergyman and author: b. in Westmoreland County, Pa., in 1846. He was

graduated at Washington and Jefferson College in 1868, and was ordained a priest in 1873; was rector of Saint John's Church, Erie, Pa., 1872-73, held rectorships at Watertown, Conn. (1873-76), and Middletown, Conn (1876-82); became rector of Saint Stephen's Church, Philadelphia, in 1882, of Holy Trinity Church, Brooklyn, N Y, in 1896; and from 1902 to 1905 was rector of All Souls' Church, New York City. He retired in the latter year He has published a 'History of the American Episcopal Church' (1890); 'Sons of God' (1891); 'Sermon Stuff' (1888, 1895); 'A Year's Sermons' (1896); 'The Open Secret'; 'The Next Step in Christianity'; 'Essays, Practical and Speculative' (1900); and 'The Evolution of Immortality' (1901); 'Confession of An Old Priest.'

McCONNELLSVILLE, Ohio, town and Morgan County seat; alt. 710 feet, on the navigable Muskingum River; served by the Baltimore and Ohio Railroad at Malta, across the river; 27m. SE. of Zanesville. Located in a farming region, it has no important industries. A monument stands at the spot where the Confederate raider Gen. John Hunt Morgan (q.v.) crossed the river. Pop. (1940) 1,895.

McCOOK, ma-kuk, Alexander McDowell, American soldier b Columbiana County, Ohio, 22 April 1831; d Dayton, Ohio, 12 June 1903 He was graduated at West Point in 1853, and with the commission of second lieutenant of the 3d Infantry was ordered to New Mexico. In 1861 he gained his captaincy and saw much service during the Civil War. He commanded the Ohio volunteers at Bull Run and rapidly gained promotion, being appointed major-general of volunteers in 1862. His brilliant military reputation was made at the battles of Shi-loh, Murfreesboro, Chickamauga, etc., and in 1865 he was brevetted brigadier-general in the regular army. He was subsequently placed in command of the military school at Fort Leavenworth, was commissioned major-general in 1894 and retired the following year. He represented the United States at the coronation of the Tsar in 1896 and in 1898-99 was a member of a commission appointed by President McKinley to investigate the work of the War Department during the War with Spain General McCook came of a fighting family. He was the son of Daniel McCook (qv) who was killed by Morgan's guerillas in 1863. Seven of the general's brothers took part in the War for the Union, three of whom, like their father, were killed Four of the eight McCook brothers attained the rank of general Consult Hosmer, J. K., 'The Appeal to Arms' (New York 1906); id, 'Outcome of the Civil War' (ib. 1906); Rhodes, J. F, 'History of the United States' (ib 1907)

McCOOK, Anson George, American soldier and politician: b. Steubenville, Ohio, 10 Oct. 1835; d. 30 Dec. 1917. At the outbreak of the Civil War he entered the Federal army as captain of an Ohio company recruited by himself. He subsequently served as major, lieutenant-colonel in the Army of the Cumberland, afterward as colonel of 194th Ohio Infantry and at end of the war was brevetted, brigadier-general. He was United States assessor of internal revenue at Steubenville, Ohio, and removed to New York in 1873. In 1876 he was elected as a Republican to the

45th Congress and re-elected to the 46th and 47th Congresses from the old 8th (city) district. Was elected secretary to the Senate of the United States, December 1883, and served as such until August 1893. On 1 Aug 1895, he was appointed city chamberlain by Mayor William L Strong, and served until the expiration of the latter's term of office, 1 Jan 1898. He was president and director of the New York Law Publishing Company.

McCOOK, Daniel, American soldier: b. Canonsburg, Pa, 20 June 1798; d near Buffington's Island, Ohio, 21 July 1863 Having received a college education, he removed from Pennsylvania to Ohio and settled at Carrollton. Although 63 years old at the outbreak of the Civil War, he entered the Union army, in which he served as major of volunteers During one of the Morgan raids (q v) he received a wound from which he died shortly after. Eight sons of his served as officers in the Federal army, three of whom were killed in battle.

McCOOK, Henry Christopher, American clergyman and entomologist b. New Lisbon, Ohio, 3 July 1837; d. 1911 He was graduated at Jefferson College (now Washington and Jefferson) in 1859, studied at the Western Theological Seminary, and in the Civil War he served as first lieutenant and chaplain in the 41st Illinois regiment, 1861-62. In 1862-63 he was minister of a church at Clinton, Ill.; from 1863 to 1870 labored in Saint Louis as a home missionary; and subsequently became pastor of the Tabernacle Presbyterian Church in Philadelphia, a charge he long retained He served as chaplain of the 2d regiment of Pennsyl-vania volunteers in the Spanish-American War, and was chaplain of the Pennsylvania Commandery of the Loyal Legion, president of the American Entomological Society, vice-president of the Academy of Natural Sciences, Philadelphia, and president of the American Presbyterian Historical Association. His writings include 'The Gospel in Nature'; 'The Moundclude 'The Gospel in Nature'; 'Ine Mound-Making Ants of the Alleghanies' (1877); 'The Agricultural Ants of Texas' (1879); 'Honey Ants and Occident Ants' (1882); 'Tenants of an Old Farm' (1884); 'The Women Friends of Jesus' (1885); 'American Spiders and Their Spinning-Work' (1889-93); 'The Latimers, a Scotch-Irish Historic Romance of the Western Insurrection' (1898); 'Martial Graves of Our Fellow Heroes in 'Martial Graves of Our Fellow Heroes in Santiago de Cuba'; 'Nature's Craftsmen: Popular Studies of Ants and Other Insects' (1907); 'Ant Communities and how they are Governed' (1909).

McCOOK, Nebr., city and Red Willow county seat, alt. 2,938 feet, on the Republican River, and the Chicago, Burlington and Quincy Railroad, 228m. W. of Lincoln. As a railroad division point in a rich agricultural region, it is a strong trading center. The railroad shops are the industrial mainstay, but the packing and shipment of food products are important. There is a public library; also a D. A. R. museum, and junior and business colleges. Settled in 1881, McCook was incorporated as a village in 1882, as a town in 1886, and as a city in 1933. It was named for Gen. Alexander McDowell McCook, a Union officer in the Civil War. It has a mayor and council. Pop. (1940) 6,212.

McCORMACK, John, Irish tenor: b. Athlone, Eire, June 14, 1884; d. Booterstown, County Dublin, Eire, Sept. 16, 1945. Educated at Summer Hill College, County Sligo, be won the gold medal for singing at the National Irish Festival (Feis Ceoil), and studied with Sabatim at Milan. On Oct. 15, 1907, he made his operatic debut at Covent Gaiden, London, as Taniddu in Cavalleria Rusticana; and on Nov. 10, 1909, he made his New York debut at the Manhattan Opera House in La Traviata. Thereafter he sang with the Chicago-Philadelphia, Metropolitan, Chicago Giand, and Monte Carlo opera companies. In 1913 he turned to the concert stage, where he achieved great popularity, especially for his singing of Irish songs. During the First World Wai he was instrumental in raising nearly a million dollars for patriotic purposes. In 1919 he became a United States citizen, and in 1928 was raised to the papal peciage, with the title and dignity of count. He made the talking motion picture, Song O'My Heart in 1929. His retirement was marked by a farewell tour in 1938, but in 1944 he started a tour for the British Red Cross. His health broke down and he was ordered by his doctor to give up singing.

McCORMICK, ma-kôr'mik, Alexander Hugh, American naval officer: b. in the District of Columbia, 9 May 1842; d 21 Aug. 1915. He was acting midshipman at the United States Naval Academy in 1859; in April 1861 entered into active service and served in blockading squadrons throughout the Civil War. He became captain in 1892. Since the Civil War he has performed various sea duties, and has served in the department of mathematics and in that of astronomy and navigation at the Naval Academy. He was inspector of ordnance, 1876–81; made a cruise around the world, 1881–85; was assigned to the ordnance department, 1885–92; to the Asiatic station, 1892–94; was captain of the Norfolk navy yard, 1894–97; member of the armor and personnel board, 1897–98; and commandant of the Washington navy yard in 1898. In 1899 he was raised to the rank of rear-admiral, and was retired 26 Maich 1900.

McCORMICK, Cyrus Hall, American inventor and manufacturer: b. in Virginia, 1809; d Chicago, 13 May 1884. He removed from his native State to Cincinnati in 1845, and two years later went to Chicago. In 1831 he invented an improved reaping-machine, which was patented and further improved, and which brought him great wealth and world-wide fame, with many decorations, medals, etc. He contributed liberally in 1859 to the establishment of the Presbyterian Theological Seminary of the Northwest, in Chicago, later called McCormick Seminary. He also endowed a chair in Washington and Lee University, Virginia.

McCORMICK, Joseph Medill, American journalist and legislator: b. Chicago, 16 May 1877 In 1900 he was graduated at Yale University. He became vice-president and publisher of the Chicago Daily Tribune and also served as president of the City Press Association. He opposed William Lorimer and was one of the leaders in the movement to oust the latter from his seat in the United States Senate. In 1912-14 he served as vice-chairman of the Progressive National committee and supported Roosevelt's candidacy for the Presidency at the

Convention of 1912. He was vice-chairman of the Progressive National Committee, 1912–14 He was twice elected to the General Assembly of Illinois, and in 1916 was elected to the National House of Representatives. He was elected to the United States Senate in 1918, but was defeated for renomination in 1924. He died at Washington, D. C., 25 Feb. 1925.

McCORMICK, Leander James, American inventor: b in Virginia, 1819; d. Chicago, 20 Feb 1900. In early life he worked with his father in manufacturing reaping-machines; removed to Chicago in 1848, and entered into partnership with his brother, Cyrus Hall McCormick (qv), and superintended the manufacturing department of their reaping-machine plant until 1879, when the firm was incorporated as the McCormick Harvesting-Machine Company. Ten years later he retired from active business Many of the improvements in the famous McCormick reaping-machine were made by him In 1871 he gave an observatory with a powerful telescope to the University of Virginia.

McCORMICK, Robert Sanderson, American diplomat, father of Joseph Medill McCormick and Robert Rutherford McCormick b Rockbridge County, Va, 26 July 1849; d. Chicago, 16 April 1919. He was educated at the University of Virginia and entered the diplomatic service as secretary of the American legation at London in 1889-92. He was appointed first Ambassador to Austria-Hungary in July 1902; was Ambassador to Russia from December 1902 to 1905; and Ambassador to France in 1905-07. He was decorated with the Order of the Rising Sun, Japan, 1907. During the Russo-Japanese War Mr McCormick represented the interests of Japan in Russia.

McCORMICK OBSERVATORY. See LEANDER McCORMICK OBSERVATORY

McCORMICK THEOLOGICAL SEM-INARY, in Chicago, Ill; opened in 1830 under the auspices of the Presbyterians, as a department of Hanover Academy, at Hanover, Ind. Ten years after its opening the school was removed to New Albany, Ind. Cyrus H. McCormick (qv) offered the institution a liberal endowment, which generous gift caused the removal of the school to Chicago, in 1859. It was at first known as the Presbyterian Theological Seminary of the Northwest. In 1886 it was named in honor of its liberal benefactor. It is now called the Presbyterian Theological Seminary. No fees are charged, and some of its income is used in assisting needy students. Recently there were connected with the seminary 15 professors and instructors and 174 students. The library contained about 55,000 volumes. The total income on productive funds and from other sources, but excluding benefactions, was about \$125,000. Its buildings and grounds were valued at nearly \$1,450,000 and its endowment funds at about \$112,375,000.

McCOSH, ma-kosh', James, Scotch-American author and educator: b Carskeoch, Ayrshire, 1 April 1811; d. Princeton, N. J., 16 Nov. 1894 He was educated at the University of Glasgow, which he entered at 13, and at the University of Edinburgh, where he went in 1829. He became a minister of the Church of Scotland; was settled at Arbroath in 1835, and

at Brechin in 1839; but at the disruption of the Scottish Church joined the Free Church, whose organization he was active in promoting. 1850 he published 'The Method of the Divine Government, Physical and Moral, in which he applied the philosophy of Sir William Hamilton to questions of theology with such skill as to elicit from him the highest commendation. This work at once gave McCosh wide fame as a philosophical thinker, and in 1851 he was appointed professor of logic and metaphysics in Queen's College, Belfast, where he remained 18 years, not only discharging his professional duties, but also entering earnestly into work of religious and social improvement, through which his spirit of benevolence and his enlightened zeal for general education accomplished lasting results. In 1868 he was elected president of the College of New Jersey (now Princeton University), having previously visited this country and become impressed with its educational promise. This promise was especially bright when he assumed the presidency of Princeton, but the conditions of transition in the sphere of higher education were such as to demand consummate powers of leadership. Such powers McCosh, although a foreigner, brought to his work with most satisfying success. During the 20 years of his administration at Princeton he saw the number of students and professors more than doubled and prosperity increased in all departments. His resignation in 1888 was due to the advance of years, and he was able to continue in the chair of philosophy beyond that period. As a philosopher he maintained the principles of the Scottish metaphysicians against all empirical methods, but went beyond his predecessors in the direction of intuitionalism, although he once declared that this "rose out of rationalism as frogs rise out of the melted ice," and few orthodox theologians were abreast of him in welcoming the evolutionary features of the new biology. His writings on theology, philosophy and psychology are very numerous and include 'Typical Forms and Special Ends in Creation,' in collaboration with Dickie (1856); 'The Intuitions of the Mind Inductively Investigated' (1860); 'The Supernatural in Relation to the Natural' (1862); 'An Examination of Mill's Philosophy' (1866); 'Laws of Discursive Thought' (1869), 'Christianity and Positivism' (1871); 'The Scottish Philosophy, Biographical and Critical' (1874); 'The Development of Hypothesis' (1876); 'The Emotions' (1880); 'Psychology of the Cognitive Powers' (1886); 'Psychology of the Motive Powers' (1887); 'Realistic Philosophy Defended' (1877), and 'Our Moral Nature' (1892). Consult Dulles, J. H., 'A McCosh Bibliography' (Princeton 1895), and Sloane, W. M., 'The Life of James McCosh' (New York 1896). tuitions of the Mind Inductively Investigated)

McCOY, Isaac, American missionary and Indian agent: b. near Uniontown, Pa., 13 June 1784; d Louisville, Ky., 21 June 1846. His early life was spent in Kentucky. Reared on the frontier, his educational advantages were very limited, but he was of a studious disposition. He was married at the age of 20 and was ordained to the ministry of the Baptist Church at 24, settling in Indiana about the same time. After serving eight years as pastor of a church, he entered the mission field among the Miami

Indians, in the valley of the Wabash River, in 1817. He subsequently labored among the people of the Pottawatomie and Ottawa tribes in Michigan During the course of his work among the Indians he became impressed with expediency of removing the Indians from the contaminating influences of the white settlements In June 1824 he submitted the matter to the consideration of the Baptist Mission Board at Washington, D C, and was authorized to present the matter to the attention of the President of the United States He failed to secure an audience with President Monroe, but he was successful in interviewing the Secretary of War, John C. Calhoun, under the jurisdiction of whose department was included all matters pertaining to the administration of In-Secretary Calhoun approved of dian affairs the scheme thus proposed for the establishment of an Indian Territory west of the Mississippi and became its champion. Although several tribes had removed to the West prior to that time, the government had no settled policy in regard to the matter until after Secretary Calregard to the matter than after Secretary Calhoun took it up officially after the suggestion was made by Mr McCoy In 1827 he again visited Washington, where he interviewed Picsident John Quincy Adams and Secretary Barbour of the War Department In 1828, Mr McCoy and Capt George Kennerly of Saint Louis were appointed by the Secretary of War as commissional to the state of the secretary of Saint Louis were appointed by the Secretary of War as commissional to the state of the secretary of the secre pointed by the Secretary of War as commissioners to conduct delegations representing the Choctaw, Creek, Pottawatomie and Ottawa tribes on an inspection of the region to be included in the proposed Indian Territory, in the performance of which duty they made two tours of the wilderness region west of Missouri and Arkansas during the late summer and autumn of 1828 During the ensuing 10 years Mr. McCoy was almost constantly in the Indian Territory (ie, the present States of Kansas, Nebraska and Oklahoma), selecting and surveying locations for immigrant Indian tribes for the government, and, at the same time, aiding in the location and establishment of missions and schools among them. He published a brief annual pamphlet entitled The Annual Register of Indian Affairs within the Indian (or Western) Territory, during the years 1835 to 1838 inclusive. Previous to that he had published a pamphlet, 'The Practicability of Indian Reform.' He was also the author of 'A History of Baptist Indian Missions.⁹ His last years were spent at Louisville, Ky., where he had charge of the work of the American Indian Mission Association

McCOY, Joseph G., American pioneer in the overland cattle trade: b. Springfield, Ill., 20 Dec. 1837; d. Kansas City, Mo, 19 Oct 1915 Reared on a farm, he made a specialty of feeding cattle for the beef market At the conclusion of the Civil War the scarcity and high price of beef and the seeming impossibility of transporting the cheap cattle from the overstocked ranges of Texas to the Northern markets, because of the introduction of splenitic fever which was certain to follow among native herds, appealed to the typically American genius of McCoy for achieving that which had been reputed to be impossible. He finally proposed the establishment of a shipping point on one of the new railways, which were then being built westward across the great plains, to which the

beef stock of Texas might be slowly driven northward during the grazing season, keeping well to the westward of the frontier settlements, and shipped thence by rail to the market at Chicago for immediate slaughter. This proposal, though simple, was so novel that railway managers at first refused to consider it seriously McCoy finally induced one of the failway companies to back him in the enterprise and he arranged to build slupping pens at Abiliene, Kan As the result of a diligent advertising campaign a few Texas ranchmen were persuaded to undertake to drive herds across, the Indian Territory to the designated shipping point on the Kausas Pacific Railway, during the season of 1867. Thirty-five thousand head of beef cattle were thus marketed that season The next year the number thus driven overland to the shipping point was increased to 75,000 head, in 1869, this number was doubled, and in 1870 the number was doubled again. When the overland cattle trade was well established the railway company soon ceased to pay the stipu lated royalties to McCoy, but he continued his active interest in the live-stock business until old age forced his retirement. He published Historic Sketches of the Cattle Trade in the West and Southwest' (1874) He was a pioneer settler at El Reno, Okla., in 1889, and was nominated as the candidate for Territorial delegate to Congress by the convention of the Democratic party in 1890.

McCRACKAN, ma-krāk'an, William Denison, American author and lecturer: b Munich, Germany, 12 Feb. 1864; d New York City, 12 June 1923 The received his earliest education at the Latin Gymnasium, Stuttgart, Germany, Samt Paul's School, Concord, N. H., and was afterward graduated at Trinity College, Hartford, Conn., in 1885. He wrote 'The Rise of the Swiss Republic' (1892); 'Romance and Tentonic Switzerland' (1894); 'Swiss Solutions of American Problems'; 'Little Idyls of the Big World' (1895); 'The Huntington Letters' (1897); 'Fair Land Tyrol' (1905); 'The Italian Lakes' (1907); 'Christian Science: Its Discovery and Development' (1912). From 1901-04 he was a member of the Christian Science Committee on Publication.

MacCRACKEN, Henry Mitchell, American Presbyterian clergyman and educator b. Oxford, Ohio, 28 Sept. 1840; d Orlando, Fla., 24 Dec 1918. He was graduated at Miami University in 1857; for four years was a teacher and school superintendent; studied at the United Presbyterian Theological Seminary, Xenia, Ohio, and at the Princeton Theological Seminary, and later at Tubingen and Berlin universities. He was minister of the Westminster Church, Columbus, Ohio, 1863–67, and of the First Presbyterian Church at Toledo, Ohio, 1869–81. In 1867 he was deputy to the General Assembly of the Free Church of Scotland, and to that of the Presbyterian Church of Ireland in 1884 From 1880 to 1884 he was chancellor of the Western University, Pittsburgh, Pa., and in the latter year became vice-chancellor and professor of philosophy in the University of the City of New York, of which he was made chancellor in 1891. Since then the name of the institution has been changed to New York University, and the seat of the University College and School of Applied Science has been re-

moved to University Heights, New York City. Under his administration the Hall of Fame for Great Americans (qv) was added to the university, its growth and prosperity greatly increased and the extension of its work and influence has given it a leading position in the field of American education. During Dr. MacCracken's active connection with the institution it grew from a college with 91 students to a university with 4,113 students, and the property increased in value from \$547,000 to \$5,211,000. He resigned the chancellorship 28 Sept 1910. Besides numerous papers on subjects of education, religion and philosophy, he published 'Tercentenary of Presbyterianism' (1870); 'Popular Sermons' (1875); 'Leaders of the Church Universal' (1879); 'John Calvin' (1888); 'Cities and Universities' (1882), 'The Scotch-Irish in America' (1884); 'A Metropolitan University' (1892); 'Educational Progress in the United States' (1893); 'Lives of Church Leaders or Heroes of the Cross' (1900); 'The Three Essentials' (1901); 'The Hall of Fame' (1901); 'Urgent Eastern Questions' (1912).

MacCRACKEN, Henry Noble, American educator: b. Toledo, Ohio, 19 Nov. 1880 He is the son of Henry Mitchell MacCracken (qv.) and was educated at New York and Harvard universities. He was instructor in English at the Syrian Protestant College in 1900-03; Harvard Fellow in 1907-08; instructor and afterward assistant professor of English at the Sheffield Scientific School at Yale in 1908-13. He was professor of English at Smith College in 1913-15, and in 1915 became president of Vassar College. In 1917-18 he was national director of the junior membership in the American Red Cross. He has written for the magazines on philology; has edited 'The Serpent of Division' (1910); 'The College Chaucer' (1913); 'Shakespeare's Principal Plays' (1914), etc. He is author of 'First Year English' (1902); and part author of 'English Composition in Theory and Practice' (1909).

MacCRACKEN, John Henry, American educator: b Rochester, Vt., 30 Sept 1875. He is the son of Henry Mitchell MacCracken (qv), and was educated at the New York University, the Union Theological Seminary and the University of Halle. He was associated with New York University as Fellow, instructor and assistant professor of philosophy in 1894-99; was president of Westminster College, Missouri, in 1899-1903; syndic and professor of politics at New York University in 1903-15; and in 1915-26 was president of Lafayette College, Easton, Pa

McCRADY, ma-krā'di, Edward, American soldier and historian: b. Charleston, S. C., 8 April 1833; d. there, 2 Nov 1903. He was graduated at Charleston College, admitted to the bar in 1855, and joined earnestly in the movement which led to the secession of his State. He took part in the capture of Castle Pinckney, 27 Dec. 1860, and was present at the bombardment of Fort Sumter in the following April. As captain of the first military company raised in South Carolina for the whole war, he entered the Confederate army, 27 June 1861, was made major and then lieutenant-

colonel, was badly wounded at the second battle of Bull Run (or Manassas), 30 Aug 1862, and in January 1863 received an injury in camp from a falling tree, in consequence of which he was transferred from field service to the command of a camp of instruction at Madison, Fla., in 1864 He remained at that post until the end of the war Later he became majorgeneral of State troops and a member of the South Carolina legislature (1880–90), where he proposed the South Carolina Election and Registration Law. Among his more important writings may be mentioned 'The History of South Carolina Under the Proprietary Government, 1670–1719' (1897); 'The History of South Carolina Under the Royal Government, 1719–1776' (1899); 'The History of South Carolina in the Revolution, 1775–1780' (1901); and 'The History of South Carolina in the Revolution, 1780–83' (1902).

McCRAE, John David, Canadian physician, soldier and poet. b Guelph, Ontario, 30 Nov. 1872; d of pneumonia in France, 28 Jan 1918 The second son of Lieut.-Col David McCrae (who organized and took over a battery to France), he was educated at the University of Toronto and took his M.D. degree in 1910. He became Governor's Fellow in Pathology at McGill University; afterwards lecturer in McCrae, the latter being his elder brother (see McCrae, the Matter). He served as a lieutenant of artillery in the South African War, taking part in several important engagements. At the part in several important engagements. At the outbreak of the European War he volunteered for service and crossed the sea in September 1914 with the Canadian Field Artillery served in the field till after the second battle of Ypres, when he was placed in charge of medicine and second in command of the hospital unit provided by McGill University Shortly before his death he had been appointed consultant to the British Armies in the Field, but had not yet entered upon that post McCrae attained the rank of lieutenant-colonel; besides achieving high military, professional and academic distinction, he had earned a creditable reputation as a poet. He did not write much, yet his verses have obtained a permanent place in modern anthologies One of his best-known works is the now famous lyric, 'In Flanders' Fields,' written during the battle of Ypres and originally contributed to *Punch*. The style is peculiarly his own:

In Flanders' Fields the poppies blow Between the crosses, row on row, That mark our place, and in the sky The larks still bravely singing fly, Scarce heard amidst the guns below. We are the dead. Short days ago We lived, felt dawn, saw sunset glow, Loved and were loved; and now we lie In Flanders' Fields

Take up our quarrel with the foe,
To you from failing hands we throw
The Torch—be yours to hold it high;
If you break faith with us who die,
We shall not sleep, though poppies grow,
In Flanders' Fields.

McCRAE, Thomas, American physician: b. Guelph, Ontario, Canada, 16 Dec 1870 He was educated at the universities of Toronto and Gottingen, and in 1904–12 was associate in medicine at Johns Hopkins Hospital, serving as associate professor of medicine of the university in 1906–12 He was professor of medicine at Jefferson Medical College, Philadelphia, and physician to the Jefferson and Pennsylvania hospitals from 1912 He was associate editor of Osler's 'System of Medicine'; was co-author, with Sir William Osler, of 'Cancer of the Stomach' (1900); and assistant author of Osler's 'Practice of Medicine' (1912; new ed., 1918). Died 30 June 1935.

McCRARY, George Washington, American justice and legislator b. Evansville, Ind., 29 Aug. 1835; d. Saint Joseph, Mo, 23 June 1890 He went with his family to the Wis-consin Territory, now a part of Iowa, when a year old, studied law in Kcokuk, Iowa, and was admitted to the bar in 1856. He was elected to the State legislature in 1857, and in 1861-65 served in the State senate where he was chairman of the committees on military affairs and the judiciary. He was a member of Congress from 1869-77, and was appointed to the committees on naval affairs, revision of laws, elections, railways and canals, and the judiciary. He proposed the formation of a joint committee for the purpose of determining the electoral vote in the Hayes-Tilden Presidential election, and was connected with the preparation and passing of the Electoral Bill. He was Secretary of War under President Hayes in 1877-79, when he was appointed justice of the United States Circuit Court He resigned in 1884 and removed to Kansas City, Mo., where he acted as general consulting attorney for the Atchison, Topeka and Santa Fé Railroad until his death. He is author of 'American Law of Elections' (1875).

McCREA, Dorothy Frances, Australian poet and story writer. See McCrea, George Gordon.

McCREA, George Gordon, Australian poet: b Anchorfield, near Edinburgh, Scotland, 29 May 1833. His father went to Australia in 1841 as warden of the Gold Fields of Australia, taking his family with him. Young McCrea was educated privately and entered the Audit Office in 1854. After serving in the office of the chief secretary and the registrar-general, he became senior examiner of patents and deputy registrargeneral. He was retired on a pension after 40 'Service. Among his published works are 'Balladeadro and Mamba' (1866-67); 'Karakorok'; 'The Man in the Iron Mask' (1873); 'A Rosebud from the Garden of Taj,' 'Afloat and Ashore' and a vast amount of material the greater part of which still remains unpublished. Among this are two dramas and 'A History of Seychelles' in two volumes. His son, Hugh Raymond McCrea, is an artist and poet well known in Australia; and his daughter, Dorothy Frances, is a clever story writer and a poet of some reputation in Australia. Deceased.

McCREA, Hugh Raymond, Australian artist. See McCrea, George Gordon.

McCREA, ma-krā', Jane, American Revolutionary heroine: b. Bedminster (now Lamington), N. J., 1753; d. near Fort Edward, N. Y.,

27 July 1777. She was the daughter of a Scotch Presbyterian clergyman, at whose death she went to live with her brother near Fort Edward, N. Y. At the commencement of the Revolution she was betrothed to David Jones, an officer of the Crown. When Burgoyne's army was advancing from the north she was visiting a Mrs MacNeil at Fort Edward. Her brother, sharing the general alarm felt through-out the region, sent for his sister, intending to remove to a safer locality. On the morning fixed upon for her departure, a band of Indians in the employ of Burgoyne suddenly swooped down upon the MacNeil household and they, together with Miss McCrea, were made prisoners. Mis. MacNeil and her party arrived in safety at Burgoyne's camp, but half an hour later another party of Indians arrived, bearing a number of freshly severed scalps, one of which bore the long glossy hair of Miss Mc-Crea, whose body was later found by a roadside. The precise manner of her death never became known. The Indians claimed that she was killed by a random shot from an American detachment, whereupon her captors determined to secure the reward for her scalp. It has been surmised that a quarrel goes among the Indians as to whose captive she was and that one of them in a frenzy tomahawked hei. Other authorities credit the story that Lieutenant Jones hired the Indians to bring his betrothed to camp where they were to be married and that she was kalled in a controversy which arose as to whose captive she was. Lieutenant Jones denied this story; he lived to an old age, a morose and gloomy man. At all events the tragedy caused a general feeling of horror throughout America and England Burgoyne called a council of his Indian chiefs in order to reprove them, but as his allies would have deserted him the offender was allowed to go unpunished. A blasted pine long marked the spot where tradition relates the beautiful young girl was murdered, and her grave may be seen in a small cemetery near the ruins of Fort Edward. Consult Bascom, R. O., 'The Fort Edward Book' (Fort Edward 1903), and Wilson, D., 'The Life of Jane McCrea' (New York 1853).

McCREARY, James Bennett, American lawyer: b. Madison County, Ky., 8 July 1838; d. 8 Oct. 1918. He was graduated at Centre College, Danville, Ky., in 1857, and from the Law School of Cumberland University, Tennessee, 1859. He entered the Confederate army in 1862 as major of cavalry and served until close of war, being then lieutenant-colonel of the 11th Kentucky Cavalry, C. S. A. He was a member of the Kentucky house of representatives in 1869, 1871 and 1873 (being Speaker 1871-73); governor of Kentucky 1875-79, and a member of Congress in 1885-97. He was a delegate to the International Monetary Conference at Brussels, Belgium, in 1891, and in 1903 became United States senator. In 1911-15 he was again governor of Kentucky. He was delegate-atlarge to the Kansas City National Democratic Convention and to the Baltimore Convention of 1912.

McCREERY, James, American merchant: b. Ireland; d. Aiken, S. C., 1893. He came to the United States when about 20 and engaged in the dry goods business in Baltimore, and at the beginning of the Civil War removed to New

York, where he soon established a business of his own which made him ultimately one of New York's leading merchants. He was a member of many public boards, one of the founders of the silk industry in America and director of numerous commercial enterprises. He was one of the Chamber of Commerce delegation sent to England two years before his death, and was a leading member of various clubs, chiefly of an educational or public character.

McCULLOCH, ma-kŭl'ō, Benjamin, American soldier: b. Rutherford County, Tenn, 11 Nov. 1811, d 7 March 1862 He became a skilled hunter and boatman and joined other frontiersmen in settling Texas In 1835 he served in the Texan war for independence, being in the battle of San Jacinto. Later he settled as surveyor at Gonzales and was elected to the Texas Congress in 1839. In the following year he was engaged in fighting the Comanches and operating against Mexican raiders. He also commanded a company of rangers in the Mexican War under Taylor and Scott, did important work as a scout, and was specially distinguished at the battles of Monterey and Buena Vista, and in the siege of the City of Mexico. In 1853 he was appointed United States marshal in Texas. In 1857 he was one of the commissioners appointed to settle the Mormon difficulties in Utah During the Civil War he served in the Confederate army, was appointed brigadier-general and sent into Missouri, where he was defeated at the battle of Dug Spring, but later united his forces with those of General Price and then defeated the Federals under General Lyon (qv) at Wilson's Creek. He commanded a corps at the battle of Pea Ridge, Ark, where he was killed by a sharpshooter while making a reconnais-sance Consult Reid, S. C., 'Scouting Expedi-tions of McCulloch's Rangers' (Philadelphia 1859).

McCULLOCH, ma-kul'oh, Hugh, American financier: b Kennebunk, Me, 7 Dec 1808; d near Washington, D C, 24 May 1895. He was educated at Bowdoin College and went in 1833 to Fort Wayne, Ind, where he established a law practice which he continued until lished a law practice which he continued until 1835 when he entered a branch of the State Bank of Indiana. He was chosen director in 1836 and in 1857 became president of the newly incorporated State Bank of Indiana. He was appointed Comptroller of the Currency in 1863 and in 1865 became Secretary of the Treasury under President Lincoln. Owing to the enormous expenses incurred by the Civil War, the finances of the country were in a critical condition; in six months the large sum due 500,000 soldiers and sailors was paid together with other heavy expenses, and a reduction of the national debt was begun. McCulloch converted more than \$1,000,000,000 of short-time obligations into a funded debt, and in less than two years had succeeded in putting the finances of the country on a sound basis. Congress approved his course and his plan for a speedy resumption of specie payment, but he met with opposition in his purpose to retire the legal-tender notes. He occupied the office until 1869 and in 1871 opened a banking business in London where he remained until 1878. He was reappointed to the Secretaryship of the Treasury by President Arthur in 1884 and continued in

office until the close of the administration. He wrote 'Men and Measures of Half a Century,' and many of his speeches together with a large share of his correspondence have been published He was the last living member of Lincoln's distinguished cabinet.

McCULLOCH, John Ramsay, English political economist b Whithorn, Wigtownshire, 1 March 1789; d London, England, 11 Nov. 1864 He was educated at Edinburgh; became editor of The Scotsman, an Edinburgh newspaper, 1818–20, and from 1818 wrote many articles for the Edinburgh Review. He was professor of political economy in London University, 1828–32, and in 1838 was appointed comptroller of the stationery office Among his many books may be mentioned 'The Principles of Political Economy' (1825); 'Historical Sketch of the Bank of England' (1831); 'Dictionary of Commerce' (1832); 'Geographical Dictionary' (1841); 'A Treatise on the Principles and Practical Influence of Taxation and the Funding System' (1845); 'The Literature of Political Economy' (1845), etc. He was one of the earliest advocates of free-trade in Great Britain.

MacCULLOUGH, ma-kül'ök, John Edward, American tragedian: b. Coleraine, Ireland, 2 Nov. 1837; d Philadelphia, 8 Nov. 1885. He came to the United States in 1853, studied for the stage and made his début in Philadelphia, 1857. He played with Edwin Forrest, who left him at his death all his manuscript plays. In 1869 he managed, with Lawrence Barrett, the Bush Street Theatre in San Francisco, Cal. His appearance in England in 1881 was not successful, but his popularity in America remained unbroken. Despite his lack of literary education, a serious handicap, he won high rank in his profession. He played De Mauprat to Edwin Booth's Richelieu, and Richmond to his Richard III His interpretation of Virginius was unexcelled during his day. Among his leading rôles were Hamlet, Macduff, Richelieu, Spartacus, etc. In 1884, at the height of his brilliant career, he suddenly collapsed, both physically and mentally; he died a year later in an insane asylum in Philadelphia. Consult Clark, 'John McCullough as Man, Actor, and Spirit' (Boston 1905).

McCULLOUGH, John Griffith, American politician: b. Welsh Tract, near Newark, Del., 16 Sept. 1835; d. 29 May 1915. He was graduated from Delaware College in 1855 and from the law department of the University of Pennsylvania in 1858. He removed to California in 1859, engaged in law practice in Mariposa County, was elected to the State legislature in 1861, to the senate in 1862 and in 1863-67 was attorney-general. In 1867-73 he practised law in San Francisco and then removed to Bennington, Vt, where he became director and president of several railway systems and prominently connected with various banking and commercial enterprises He was elected to the Vermont senate in 1898 and in 1902 was elected governor of the State.

McCUMBER, m'kum'ber, Porter James, American legislator: b. Crete, Will County, Ill., 3 Feb 1858. He was graduated at the University of Michigan in 1880 and engaged in the practice of law. He was the senior member of the law firm of McCumber and Bogart at Wahpeton, N. Dak (1881-1900). He served in the Territorial house of representatives in 1885-89; was state's attorney, Richland County, in 1896-97. He was elected to the United States Senate in 1899 and re-elected four times. He died 18 May 1933.

MacCUNN, ma-kun', Hamish, Scottish composer: b. Greenock, Scotland, 22 March 1868; d. 1916 Was educated in Greenock and at the Royal College of Music, London, made his début in the musical world in 1887, and in 1888 became a junior professor of harmony in the Royal Academy of Music, which position he resigned in 1894. As a composer he attained high rank; his productions are rich in melody, and his command of the orchestra is remarkable. His work is typically Scottish in character and in choice of subject. Among the more important of his numerous works are overtures, etc, 'The Land of the Mountain and the Flood'; 'Chior Mhor'; 'The Dowie Dens o' Yarrow'; 'The Ship o' the Fiend'; dramatic cantatas, 'Lord Ullin's Daughter'; 'Bonny Kilmeny'; 'Lay of the Last Minstrel,' and the operas, 'Jeannie Deans' and 'Diarmid'

MacCURDY, George Grant, American anthropologist. b. Warrensburg, Mo., 17 April 1863. He was graduated from the State Normal School, Warrensburg, 1887; from Harvard, 1893, A.M in 1894, and thereafter studied at Vienna, Paris and Berlin. Since 1898 he has been connected with Yale University, becoming in 1923 research associate, with rank of professor, and curator of anthropological collections. His publications include 'Some Phases of Phe-historic Archaeology' (1907); 'Antiquity of Man in Europe' (1910); 'Human Origins' (2 vols., 1924); 'Prehistoric Man' (1928).

McCURDY, ma-ker'di, James Frederick, Canadian Orientalist: b Chatham, N. B, 18 Feb. 1847. He was educated at the University of New Brunswick, Princeton Theological Seminary and in Germany He was assistant prolary and in Germany free was assistant professor in Oriental languages at Princeton, 1873–82; and Stone lecturer there in 1885–86 In 1886 he was appointed lecturer in University College of Toronto, and from 1888–1914 was professor of Oriental languages in that college Among his works are 'Aryo-Semitic Speech' (1881); 'History, Prophecy and the Monuments' (3 vols, 1894–1901); 'Life and Work of D. J. Macdonnell' (1897); an original commentary on Haggai, and various translations for the American edition of 'Lange's Com-mentary,' etc. He died 30 April 1935.

McCURDY, Richard Aldrich, American capitalist: b. New York City, 29 Jan. 1835; d. Morristown, N. J., 6 March 1916. He was graduated at Harvard University in 1856, and engaged in the practice of law in New York He became attorney for the Mutual Life Insurance Company in 1860, vice-precident in surance Company in 1860, vice-president in 1865 and was president in 1885–1906. The investigation of his company in 1905 revealed mismanagement and mismanagement and gross extravagance, particularly in the matter of salaries for the officials He resigned and retired in 1906

McCUTCHEON, mă-kǔch'ŭn, George Barr. American novelist: b near Lafayette, Ind., 26 July 1866: d. 1928. Educated at private

schools and at Purdue University. After leaving college, before graduation, he became a reporter on the Lafayette Morning Tournal, at a salary of \$6 a week Prior to that time he had written a series of dialect letters for the Sunday Leader, of Lafavette, under the caption (Waddleton Mail,) published in that paper in 1890 After three years on the Journal, he became city editor of the Lafayette Daily Courier, serving in that capacity until June 1902, when newspaper work was abandoned for novel-writing alone While with the Courier, he contributed to that newspaper a serial story entitled 'The Wired End.' which has never been published in book form; and also contributed short stories to various magazines during these years. He went to Chicago to reside in 1902, and in July 1910 re-

Chicago to reside in 1902, and in July 1910 removed to New York City

His novels include 'Graustark' (1901), dramatised; 'Castle Craneycrow' (1902); 'Brewster's Millions' (1903), dramatised; 'The Sherrods' (1903); 'The Day of the Dog' (1904), novelette; 'Beverly of Graustark' (1904), dramatised; 'The Puiple Parasol' (1905), novelette; 'Nedra' (1905); 'Cowardice Court' (1906), novelette; 'Jane Cable' (1906); 'The Flyers' (1906), dramatized, novelette; 'The Daughter of Anderson Crow' (1907); 'The Husbands of Edith' (1908), novelette, dramatized; 'The Man from Brodney's' (1908); 'Truxton King' (1909), dramatized, 'A Fool and His Money' (1913); 'Black is White' (1914); 'The Prince of Graustark' (1914); 'Mr. Bingle' (1915); 'The Light That Lies' (1917); 'Shot with Crimson' (1918); 'Sherry' (1918), 'Anderson Crow, Detective' (1920); 'Yollopp' (1922); 'Oliver October' (1923); 'East of the Setting Sun' (1924); 'Romeo in Moon Village' (1925). He was author also of numerous short stories. numerous short stories.

McCUTCHEON, John Tinney, American cartoonist: b. near South Raub, Ind., 6 May 1870 He is a brother of G. B. McCutcheon (q.v.). He was graduated from Purdue University in 1889 and has been connected with the leading newspapers of Chicago since 1889, his work as a cartoonist becoming famous in the campaign of 1896 He started around the world on dispatch boat McCulloch in January 1898; was on board that vessel, during the war with Spain, in battle of Manila Bay 1898. In 1899 he made a tour of special service in India, Burma, Siam and Cochin China and later in northern China, Korea and Japan, returning to the Philippines during the fall campaign there. He sollowed the various campaigns on the islands until April 1899 when he was sent to the Transvaal. He joined the Boers in the interest of his paper and furnished political cartoons for the Chicago Record during the campaign of 1900. In 1909–10 he visited Africa, the while contributing articles and cartoons for the Chicago Sunday Tribune. He went to Mexico as special correspondent in 1914; was with the Belgian and German armies in the autumn of the same year, and in France, Saloniki and the Balkans in 1915-16. He has published 'Stories of Filipino Warfare' (1900); 'Cartoons by McCutcheon' (1903); 'Bird Centre Cartoons' (1904); 'The Mysterious Stranger and Other Cartoons' (1905); 'Congressman Pumphrey the People's Friend' (1907); 'In Africa' (1910); 'T. R. in

Cartoons' (1910); 'Dawson '11—Fortune Hunter' (1912), 'An Heir at Large.' In 1931 he was awarded a Pulitzer Prize for the excellence of his cartoons.

McDANIEL, Henry Dickerson, American state governor. b Monroe, Ga, Sept 4, 1836; d. there, July 25, 1926 He graduated from Mercer University, Macon, Ga, 1856, and was admitted to the bar in 1857. He attended as delegate the Georgia Secession Convention in 1861, and served in the Confederate Army until the end of the war, attaining the rank of major in the 11th Georgia Infantry. In 1865 he was a member of the Georgia Constitutional Convention He served in the state legislature, 1873–1874, and was state senator, 1874–1883; from 1883 to 1886 he was governor of Georgia.

McDANIEL, Walton Brooks, American philologist and educator b Cambridge, Mass, March 4, 1871. He graduated from Harvard in 1893 He was assistant in Latin and Greek at Harvard in 1896–1897, instructor there and at Radcliffe College in 1899–1901, and from 1909 was professor of Latin at the University of Pennsylvania. He wrote Roman Private Life and Its Survivals (1924); and Guide for the Study of English Books on Roman Private Life (1926).

McDIARMID, mäk-dĭr'mĭd, Hugh (pseudonym of Christopher Murray Grieve), Scottish author and poet: b. Langholm, Dumfriesshire, Aug 11, 1892. An ardent nationalist, he is known as one of the founders of the Scottish Nationalist Party and the editor of The Voice of Scotland, a quarterly magazine Among his works in prose are Annals of the Five Senses; Albyn, or the Future of Scotland; Scottish Scene, Scottish Eccentrics; The Scottish Islands; and an autobiography entitled Lucky Poet. His volumes of verse include: Sangschaw, Penny Wheep; A Drunk Man Looks at the Thistle; Stony Lunits, First Hymn to Lenin; Cornish Heroic Song for Valda Trevlyn.

McDONALD, Andrew Archibald, Canadian statesman: b. Three Rivers, Prince Edward Island, Feb. 14, 1829; d March 21, 1912 He entered public life in 1853 as a member of the island assembly, serving until 1858, and again in 1863-1874 He was a delegate to the Quebec Conference on the Union of the Provinces in 1864, and in 1873 became provincial postmaster general, also serving as acting post office inspector until 1884 In 1884–1889 he was lieutenant governor of the province, and from 1891 he was a member of the Dominion Senate.

MacDONALD, Arthur, American criminologist and author: b Caledonia, N.Y., July 4, 1856; d Washington, D.C., Jan. 17, 1936. He was educated at the University of Rochester and the Princeton and Union theological seminaries, and later studied medicine at Berlin, Leipzig, Paris, Zurich, and Vienna. From 1892 till 1904 he was connected with the United States Bureau of Education as a specialist in possibilities of education for the abnormal and weakling classes. He represented the United States at three international psychological and criminological congresses, and was honorary president of the Congress of Criminal Anthropology, in Europe. He made a special study of American

and European prisons and asylums for the insame and for mebriates His books include: Abnormal Man (1893); Education and Patho-Social Studies (1896); Statistics and Crime, Suicide and Insanity (1903); Juvenile Crime and Reformation (1908); Mentality of Nations and Social Pathology (1912).

MACDONALD, Sir Claude Maxwell, British soldier and diplomat b June 12, 1852; d London, Sept 10, 1915 In 1872, after attending the Royal Military College, Sandhurst, he was commissioned 2d lieutenant in the 74th Highlanders. He served in the Egyptian campaign in 1882, and took part in the Suakin expedition, in the eastern Sudan, during 1884–1885; in 1887 he was appointed consul general at Zanzibar. Transferred to West Africa a year later, in 1891 he became the first British administrator in the Oil Rivers Protectorate (which later became the colony of Nigeria) In 1896 he was appointed British minister at Peking (Peiping); he organized the defense of the foreign legations in that city, when they were besieged during the Boxer Rebellion (see Boxers) June–August, 1900. Appointed in October 1900 Great Britain's first ambassador of Tokyo (previous diplomats holding only the rank of minister), he was responsible in considerable measure for effecting the Anglo-Japanese alliance of 1905.

MACDONALD, Duncan Black, American professor of theology b Glasgow, Scotland April 9, 1863; d. Hartford, Conn., Sept. 6, 1943 After graduating from the University of Glasgow in 1885 he studied at the University of Berlin, and came to the United States in 1892, from which date until 1931 he was professor of Semitic languages at Hartford Theological Seminary. He was Haskell lecturer on comparative religion at the University of Chicago, 1906; special lecturer at Wellesley College, 1907–1909; at the Episcopal Theological School, Cambridge, 1912; Lamson lecturer on Mohammedanism at Hartford Theological Seminary, 1909; head of the Mohammedan department at the Kennedy School of Missions, Hartford, 1911–1925; Haskell lecturer, Oberlin College, 1914, lecturer on the Old Testament, Berkeley Divinity School, 1917–1918 He discovered in the Bodleian Library (qv.) in 1910 the only known Oriental manuscript of Ali Baba and the Forty Thieves which he published in the Journal of the Royal Assatic Society of Great Britain, of which he was a member His writings include The Development of Muslim Theology (1903); Aspects of Islam (1911); Hebrew Literary Genus (1933); Hebrew Philosophical Genius (1935).

MACDONALD, Flora, Scottish Jacobite heroine: b. Milton, South Uist, Hebrides, 1722; d Kingsburgh, Scotland, March 5, 1790. She lost her parents early, and was brought up by the chief of her clan, Macdonald of Clanranald; later she was adopted by Lady Macdonald of Skye After the Battle of Culloden, in 1746, her assistance was sought in securing the escape of Prince Charles Edward, who had taken refuge at Benbecula, where Flora MacDonald was then living. The prince was disguised as a woman servant and the party succeeded in reaching Skye in safety. Flora's assistance to the prince became known, however, and she was imprisoned in the Tower of London, but was soon after-

ward permitted to live outside the prison, although under charge of a jailer. The Indemnity Act of 1747 secured her complete liberty. She was married to Allan Macdonald in 1750, and in 1774 they emigrated to America, settling in Fayetteville, N.C. Her husband served in the British Army in the Revolutionary War, and was taken prisoner. Flora returned alone to Scotland in 1779, and was later rejoined by her husband. She was a woman of great beauty and charm of manner, Dr. Samuel Johson among others, being warm in her praises. Five of her sons served in the British Army or Navy. Consult Ewald, A.C., Life and Times of Prince Charles Edward (1886); Macgregor, A., Flora Macdonald and Her Adventures with Prince Charles (1901).

MACDONALD, George, Scottish poet and novelist: b Huntly, Aberdeenshire, Dec 10, 1824; d. Ashtead, Surrey, Sept. 18, 1905. He was educated at Aberdeen University and at King's College, London, and entered the Independent ministry, from which he afterward retired and became a lay member of the Anglican Church. Macdonald's work comprised poetry, novels, and religious and juvenile books, and was marked by deep religious feeling and devotion to lofty ideals of life. His novels dealt chiefly with Scottish character and scenery, in which they held the place of classics. The best known of his many books were David Elginbrod (1862); Alec Forbes of Howglen (1865); Annals of a Quiet Neighborhood (1866); Robert Falconer, his best work (1868); The Miracles of Our Lord (1870); Malcolm (1875); The Marquis of Lossie (1877); Sir Gibbie (1879); Castle Warlock (1882).

MACDONALD, Sir Hector Archibald, British army officer: b. Muir of Allan-Grange, Ross-shire, Scotland, April 13, 1853; d. Paris, France, March 25, 1903. In 1870 he enlisted in the 12d (Cordon) Highlanders and for nine the 92d (Gordon) Highlanders, and for nine years served in the ranks. He first saw active service in the Second Afghan War, in 1879, acquitting himself with such distinction that he was given a commission as second lieutenant. During the Anglo-Boer War of 1880-1881 he was captured at Majuba Hill. He was sent to Egypt in 1884 to aid in reorganization of the Egyptian Army, and took part in the operations on the Nile in 1885 and the Suakin campaign in 1888-1891; for his part in the capture of Tokar in 1891 he was awarded the Distinguished Service Order. During the Dongola expedition of 1896 he commanded a brigade of Egyptian troops, and by his adroit handling of his troops at the Battle of Omdurman, in 1898, he turned into victory what might have proved a disaster. He was promoted colonel that same year, and in 1899, with the rank of major general, he commanded troops in the Punjab Province of India. In December 1899, following outbreak of the South African War (q.v.), "Fighting Mac," as he was popularly termed, was given command of the Highland Brigade, for service under Lord Roberts (see Roberts of Kandahar). He captured Koodoesberg early in February 1900, and after Kimberley was relieved, led his Highlanders in a series of engagements which resulted in the surrender at Paardeberg of Gen. Piet Arnoldus Cronjé (q.v.). In 1901 he received a knighthood, and the next year was appointed to command the troops in Ceylon. Recalled to Britain to answer charges against him, he committed suicide in a Paris hotel. MACDONALD, SIR Hugh John, Canadian statesman, son of Sir John Alexander Macdonald (q.v.): b. Ontario, March 13, 1850, d. March 29, 1929. He was educated at Queen's College and at the University of Toronto, became a barrister in 1872, practicing in Toronto until 1882, when he removed to Winnipeg. In 1891-1893, and again in 1896-1897, he was a member of the Canadian House of Commons; and in 1896 he was minister of the interior. He was premier and attorney general of Manitoba in 1900. After 1911 he was police magistrate of the city of Winnipeg, and he also served as commissioner of railways in Manitoba. He served in the Fenian Raid of 1866 and the Red River Expedition of 1870; and in the Northwest Rebellion he was captain of the 19th Regiment. He was knighted in 1913

MACDONALD, Jacques Étienne Joseph Alexandre, Duc de Tarente. French military officer: b. Sedan, Nov. 17, 1765; d. Courcelles-le-Roi, Sept. 7, 1840. Of Scottish descent, he was related to Flora Macdonald (q.v.). He served in the French Revolution as colonel, brigadier general and general. In 1798 he was made governor of the Roman states, and of Naples the following year. In 1805 he lost the favor of Napoleon, but four years later was given command of the right wing of the aimy in Italy; he was made a marshal for his services at Wagram, July 6, 1809. He served in Spain and in the Russian campaign, assisted in covering the retreat from Leipzig, and in 1814 advised Napoleon's abdication. At the Restoration (q.v.) he gave his allegiance to Louis XVIII. Created a peer of France, in 1816 he became major general of the royal bodyguard; he retired in 1830.

McDONALD, James, Canadian statesman and jurist: b. East River, Nova Scotia, July 1, 1828; d. 1912. He was educated at New Glasgow, was admitted to the bar in 1851, and became queen's counsel in 1867. He served in the legislature of Nova Scotia in 1859–1867 and in 1871–1872, when he resigned; and was a member of the Canadian Parliament in 1874–1881. In 1863–1864 he was chief railway commissioner for Nova Scotia, and financial secretary from 1864 until the union with the Dominion of Canada in 1867. He was minister of justice of Nova Scotia in 1878–1881, and chief justice in 1881–1904.

MACDONALD, James Alexander, Canadian journalist: b. East Williams, Middlesex County, Ontario, Jan. 22, 1862; d. Toronto, Ontario, May 13, 1923. Nationally known as "Masdonald of the Globe," James Alexander was educated at Knox College, Toronto, and in 1891 was ordained to the ministry of the Presbyterian Church. In 1891–1896 he was pastor of Knox Church, St. Thomas, Ontario. In the latter year he founded a religious paper in Toronto, which he called the Westminster. In 1902 he became managing editor of the Toronto Globe. In this post he acquired a national reputation and great influence and left his mark on Canadian journalism and on Canadian public life. Ill health forced a partial retirement in 1916. He collected many of his papers and addresses in Democracy and the Nations (1915) and The North American Idea (1917). He also published a memorial volume on William Caven of Knox College (1908).

McDONALD, James Alexander, Canadian jurist: b. 1858, Huron County, Ontario; d. Victoria, British Columbia, Dec. 20, 1939 Educated at the University of Toronto, he became a barrister in 1890 and king's counsel in 1906. He engaged in practice in Toronto until 1896 when he removed to Rossland, British Columbia, where he practiced until 1909. In that year he became chief justice of the Court of Appeals, British Columbia, and in 1929 he became chief justice of British Columbia. He retired in 1937.

MacDONALD, James Ramsay, British statesman: b. Lossiemouth, Scotland, Oct. 12, 1866. He received an elementary education and became a teacher. In 1884 he came to London where he worked as a clerk for \$3 12 per week. In the capital he continued his education by attendance at evening classes. His experiences led him to embrace Socialism and in 1894 he joined the Independent Labor Party. He was elected to the London County Council in which led the development of the county of the london county of th body he developed his abilities as a public speaker. In 1897, Mr. MacDonald visited the United States and Canada and subsequently visited South Africa, New Zealand, Australia and India. He helped found the Labor Party in 1900. Six years later he was elected to Parliament from Leicester. He opposed Great Britain's entry into the World War, was widely denounced therefor, and in the election of 1918 lost his seat. In 1922 he was re-elected and as head of the Labor Party became leader of the opposition. Following the general election of 1923, the Labor Party expressed its willingness to take office and on Jan. 24, 1924 a Labor Government, the first in British history, took the reins of government, with Mr. MacDonald as Prime Minister and Foreign Secretary. He remained in office until his party suffered defeat in the election of October 1924. He and his party were returned to power in May 1929 and Mr. MacDonald to power in May 1929 and Mr. MacDonald to Description of the president of the preside again assumed the Premiership. He visited President Hoover the same year. His government was at once faced with the problem of unemployment and managed to weather many storms until the financial crisis in the summer of 1931 forced a policy of retrenchment on the government in which the rank and file of the Labor Party was unwilling to follow its leader. Mr. MacDonald thereupon formed a "National" government in which he included members of all parties. In the elections of October 1931, the Labor Party suffered a serious setback, but MacDonald headed the new coalition government (Nov. 1931), and continued in office until he resigned, June 7 1935, because of ill health. Died at sea, Nov. 9, 1937.

MacDONALD, James Wilson Alexander, American sculptor: b. Steubenville, Ohio, Aug. 25, 1824; d. Aug. 14, 1908. He studied under Waugh in Saint Louis and in New York in 1849. Among his numerous works are statues of Joan of Arc, Italia; Edward Bates; etc.

MACDONALD, SIR John Alexander, Canadian statesman: b. Glasgow, Scotland, Jan. 11, 1815; d. Ottawa, Ontario, June 6, 1891. In early youth he emigrated with his father to Canada. At 21 he was a practising barrister at Kingston, Upper Canada, and in 1844 he was elected to the Canadian Parliament for that constituency. He became a cabinet minister in 1847,

and, after various vicissitudes of his party, Prime Minister in 1857. Macdonald's most important work is connected with the federation of Canada. The French and the English provinces, previously independent, had been united under one Parliament in 1841, and during the next 25 years each party had both an English and a French leader. Ministries changed rapidly, and in 1864 there was a deadlock. This made necessary some wider union; and in that year a conference of delegates met at Quebec to consider the federation of British North America. Directed largely by Macdonald's tact and resource this conference led to the establishment of the Dominion of Canada in 1867, under the British North America Act, passed by the British Parliament. Macdonald became the first Prime Minister of the Dominion. At first there were only four provinces, but he carried through successfully the negotiations by which the Hud-son Bay company ceded its interests in the northwest to Canada; he secured also the entrance of British Columbia on the condition of building rapidly a transcontinental railway. During an election in 1872 Macdonald accepted large sums for party purposes from Sir Hugh Allan, one of the chief projectors of the Pacific railway, and in 1873 owing to this "Pacific Scandal" he was forced to retire from office In 1878 he again become Purpo Ministry and In 1878 he again became Prime Minister with a policy of protection and he may be regarded as the father of that system in Canada. He remained Prime Minister until his death in 1891. The confederation of Canada, the acquisition by Canada of the Northwest, the building of the Intercolonial and the Canadian Pacific railways, and the policy of protection were all effected under Macdonald's lead. His brilliant intellect and ready wit made him a really great leader. In 1867 he was created K.C.B., in 1884 G.C.B., and on his death his widow was created Baroness Macdonald in her own right. Consult Pope's Memoirs of Sir John A. Macdonald (1894); Parkin, Sir John A. Macdonald in Makers of Canada (1908).

George M. Wrong, Professor Emeritus of History, Univ. of Toronto.

McDONALD, John Bartholomew, American engineer and contractor: b. Ireland, Nov. 7, 1844; d. March 17, 1911. He was brought to the United States in 1847, and received his education in the public schools of New York. Among his successful undertakings may be mentioned the Fourth avenue improvement for sinking the New York Central Railroad tracks in New York City from 42d street to Harlem; West Shore Railroad from Weehawken to Buffalo; Baltimore and Ohio Railroad from Baltimore to Philadelphia; Illinois Central Railroad from Elgin, Ill., to Dolgeville, Wis.; the Georgian Bay branch of the Canadian Pacific Railroad; the Trenton "cut-off" of the Pennsylvania Railroad; the Baltimore Belt Railroad, which carried the great Baltimore and Ohio Railroad under the city of Baltimore, etc. He constructed the Jerome Park reservoir, New York City, one of the largest artificial storage reservoirs in the world. His greatest contract was for the construction, equipment, operation and maintenance of the Rapid Transit Railroad (the "Subway") in New York City.

MACDONALD, John Sandfield, Canadian statesman: b. Samt Raphael's, Canada, Dec. 12,

1812; d Cornwall, Ontario, 1 June 1872. He was self-educated and admitted to the bar in 1840, practising successfully in Cornwall. In 1841 he was elected to the Canadian Parliament as member from Cornwall Macdonald was solicitor-general in 1849–51, 1852–54 was speaker of Parliament, Attorney-General in the brief Biown-Dorion administration in 1858, and Premier in 1862–64. He was the first Premier of the province of Ontario, 1867–71.

McDONALD, Joseph Ewing, American lawyer b Butler County, Ohio, 29 Aug 1819, d Indianapolis, Ind, 21 June 1891 He was educated at Ashbury (now De Pauw) University; studied law and was admitted to the bar in 1844, and established a practice in Crawfordsville, where he was county prosecuting attorney, 1845–47. In 1848 he was member of Congress and from 1856–60 attorney-general of Indiana He then practised law in Indianapolis and in 1864 was an unsuccessful candidate for governor being defeated by Oliver P. Morton In 1872 he was chairman of the Democratic State Committee and in 1875 was elected to the United States Senate, serving until 1881, when he returned to Indianapolis where he resumed the practice of law.

MacDONALD, William, American educator and historian b Providence, R. I, 31 July 1863. He was graduated at Harvard in 1892, and in 1892–93 was professor of history and economics at Worcester Polytechnic Institute. He was professor of history and political science at Bowdoin in 1893–1901, from 1901 to 1917 was professor of history at Brown University, and in 1924–26 lecturer on American history at Yale. He edited 'Select Documents Illustrative of the History of the United States' (1898); 'Johnston's High School History of the United States' (1901); 'Documentary Source Book of American History' (1908); Parkman's 'Oregon Trail' (1911). Author of 'A New Constitution for America' (1923); 'The Intellectual Worker and his Work' (1923). D. 15 Dec. 1938.

MacDONALD, SIR William Christopher, Canadian capitalist and philanthropist: b. Glenaladale, Prince Edward Island, 1831, d. Montreal, 11 June 1917. He early engaged in business in Montreal and achieved a large financial success as importer, merchant and tobacco manufacturer. He was a director of the Bank of Montreal, a governor of McGill University and of the Montreal General Hospital, and also served as president of the Legislative Council of Prince Edward Island. His gifts to McGill University and the MacDonald Agricultural College connected with it amounted to more than \$12,500,000. He also made large gifts to the normal school at Sainte-Anne de Bellevue, province of Quebec, the Ontario Agricultural College and to different hospitals. He was knighted in 1898.

McDONALD, Pa., borough in Allegheny and Washington Counties; on the Montour, and the Pennsylvania railroads; 18m. SW. of Pittsburgh. A coal-mining and oil field community; a large coal washing plant is located near by. Pop. (1940) 3,530.

MACDONELL, măk-dŏn'ĕl, Alexander, Canadian Roman Catholic prelate: b Inverness-shire, Scotland, 7 July 1762; d. Dumfries, Scotland, 14 Jan. 1840. He was educated at

the Scots College, Spain, entered the priesthood in 1787, and was for several years a missionary. He assisted in the organization of the Glengarty Fencibles and was their chaplain and in 1803 established for its disbanded members a colony in Glengarry County, Ontario. Canada He also assisted in raising the Canadian regiment of Glengarry Fencibles, which was actively engaged in repelling the American invaders in the War of 1812-14 In 1819 he was made vicai apostolic of Upper Canada and through his influence 48 parishes were established in Upper Canada. He was the first Roman Catholic bishop in Upper Canada, being consecrated bishop of Kingston, 14 Feb 1826 He was called to the Legislative Council in 1831 He died in Scotland while on a mission to obtain funds for the founding of Regiopolis College, Kingston, and is builed in his episcopal

MacDONELL, Arthur Anthony, English philologist: b. Lochgarry, 11 May 1854; d. 28 Dec. 1930. He was educated at Gottingen and at Corpus Christi College, Oxford. He was teacher of German at Oxford in 1880-99 and professor of Sanskrit in 1888-99, after which he was Boden professor of Sanskrit there. He made a tour of study and research in India in 1907-08, and in 1914 received the Campbell Memorial Gold Medal for Oriental Research from the Royal Asiatic Society of Bombay. He was keeper of the Indian Institute; and a Fellow of Balliol College and of the Royal Danish Academy Author of 'Sanskrit-English Dictionary' (1892); 'A History of Sanskrit Literature' (1900); 'The Bihaddevata' translated and critically edited (2 vols., 1904); 'Vedic Grammar' (1910); 'A Vedic Grammar for Students' (1916); 'India's Past' (1926).

MacDONELL. Daniel James, Canadian clergyman. b. Bathurst, New Brunswick, 15 Jan. 1843; d. 1896 He was graduated at Queen's College, Kingston, in 1858 and later studied at Glasgow, Heidelberg and Edinburgh universities. He was ordained in the Presbyterian ministry, at Edinburgh, in 1866, returned to Canada and served as minister of Saint Andrew's Church, Peterborough, until 1870, when he removed to Toronto to take charge of the imposing new Saint Andrew's Church which had been built for him there. His expression of doubt in regard to certain doctrines of the Church, particularly that of eternal punishment, led to his being tried for heresy. While not subscribing to a personal belief in the doctrines upon which he had expressed doubts he formally endorsed them and agreed not to discuss them in the pulpit. His influence generally was regarded as having contributed appreciably to a broader trend of thought in the Church. He took an active part in bringing about the union of the different branches of the Presbyterian Church in Canada, which was effected in 1875. He was noted for his sound learning and for his eloquence. He was one of the editors of the 'Canadian Presbyterian Hymnal' (1878-81).

MacDONNELL, Anthony Patrick, 1sr Baron: b. 17 March 1844, d. London, England, 9 June 1925. He was educated at Queen's College, Galway, and entered the Indian Civil Service in 1865. He was appointed acting chief commissioner of Burmah in 1889. chief commissioner

sioner of the Central Provinces in 1891, acting lieutenant-governor of Bengal in 1893, and served on the council of the viceroy of India in 1893–95. He was lieutenant-governor of the Northwestern Provinces and chief commissioner of Oudh in 1895–1901, was a member of the Council of India in 1902, and Under Secretary of State in Ireland in 1902–08. He was created a baron in 1908.

McDONNELL, Charles Edward, American Roman Catholic prelate: b. New York, N. Y., 1 Feb. 1854; d. 8 Aug. 1921. He was educated at the De La Salle Institute and Saint Francis Xavier's College in New York and studied theology at the American College, Rome, Italy, where he received the degree of DD., and was ordained priest by Bishop Chatard 18 May 1878. Returning to America the same year, he was appointed assistant at Saint Mary's Church, New York City, and in 1879 was transferred to Saint Patrick's Cathedral. On the death of Bishop Loughlin, Dr. McDonnell, who, at the time was Archbishop Corngan's secretary, was named bishop of Brooklyn, being consecrated by Archbishop Corrigan 25 April 1892. At his invitation the Benedictine Fathers came from the Bahama Islands to establish themselves in his diocese, and the Redemptorists also made a foundation in Brooklyn. On the passage of the French law separating Church and State, Dr. McDonnell invited a number of French communities of men and of women to take up their residence in his diocese. He was spiritual adviser of the Catholic Benevolent Legion, and also honorary president of the International Catholic Truth Society.

McDONOGH, măk-don'ō, John, American phalanthropist: b Baltimore, Md, 29 Sept. 1779; d McDonogh, La, 26 Oct. 1850 He was educated at an academy in Baltimore and entered the mercantile business there, removing in 1800 to New Orleans, where he rapidly acquired great wealth He was deeply interested in the problem of slavery and devised a system through which his slaves were enabled to earn their freedom, he educated those among them who desired it, and sent to Africa shiploads of those who had earned their freedom. He was president of the American Colonization Society and was a generous contributor to its support. The bulk of his fortune of more than \$2,000,000 he bequeathed to the cities of New Orleans and Baltimore for the establishment of free schools. The will was adjudged valid after years of litigation and Baltimore established the McDonogh schools while New Orleans invested its portion of the bequest in its public schools

MACDONOUGH, măk-dŏn'ō, Thomas, American naval officer: b. Newcastle County, Del, 23 Dec 1783; d at sea, 18 Nov 1825 He entered the navy as midshipman in 1800 and in 1803 was attached to the frigate Philadelphia, one of the squadron employed against Tripoli. On 26 Aug. 1803 the Philadelphia captured off the coast of Spain the Moorish frigate Mesboa and MacDonough, being left at Gibraltar with the prize, escaped the subsequent capture which befell the officers and crew of the Philadelphia In 1804 he participated in the various attacks made upon Tripoli and under

Decatur assisted in the capture and destruction of the Philadelphia, 16 Feb 1804 In 1810 he was furloughed and for a while commanded a vessel in the merchant service. On the outbreak of the War of 1812 he was for a time first lieutenant on the Constitution, and commanded for some months at Portland. In 1814 he had command of the squadron on Lake Champlain which gained an important victory at Plattsburg harbor over the British squadron commanded by Commodore George Downie. For his valuable services on this occasion he was promoted to the rank of captain, then the highest in the United States navy, and received from Congress a gold medal and an estate at Cumberland Head, near Plattsburg, from the Vermont legislature. He afterward held various commands, the last of which was on the Constitution in 1824, in which he made a cruise to the Mediterranean Consult Babcock, K. C., (Rise of American Nationality) (New York 1906)

MACDOUGAL, mak-doo'gal, Daniel Trembly, American botanist: b. Liberty, Ind., 16 March 1865 He was graduated at De Pauw University in 1890 and studied in Germany In 1891-92 he was engaged in explorations in Arizona and Idaho for the United States government, and in 1893-99 was instructor in plant physiology at the University of Minnesota He was appointed director of the laboratories of the New York Botanical Gardens in 1899, and after 1905 was director of the botanical research department of the Carnegie Institution. He was president of the American Society of Nature and Work of Plants' (1900); 'Practical Text-book of Plant Physiology' (1902); 'Elementary Plant Physiology' (1902); 'Elementary Plant Physiology' (1902); 'Influence of Light and Darkness upon Growth and Development' (1903); 'Botanical Features of North American Deserts' (1908); 'The Water-Balance of Succulent Plants' (1910); 'The Condition of Parasitism in Plants' (1910); 'Organic Response' (1911); 'The Salton Sea' (1913); 'Growth in Trees' (1924)

(1910); 'Organic Response' (1911); 'The Salton Sea' (1913); 'Growth in Trees' (1924)

McDOUGALL, Alexander, American soldier b Island of Islay, Scotland, 1731; d New York, 8 June 1786 He emigrated with his father to America in 1755 and later became a merchant in New York. He devoted himself to the cause of the colonies and was imprisoned for a time for writing an address called 'A Son of Liberty to the Betrayed Inhabitants of the Colony.' At the outbreak of the Revolution he enlisted in the American army, serving as colonel, brigadier-general, and in 1777 was promoted major-general He commanded at Long Island, White Plains and also attained distinction in the action at Germantown. He was elected member of the Confinental Congress in 1781 and was for a time Minister of Marine Re-elected in 1784-85 he served for a time and then resigned, preferring active service in the field He was elected Minister of Marine and thereby became the first Secretary of the United States Navy. He was a member of the New York State senate at his death

McDOUGALL, George Millward, Canadian pioneer missionary: b. Kingston, Ontario, 1820; d. Canadian North West, January 1876. He removed to Georgian Bay with his parente when a child, later studied at Victoria College,

and in 1850 entered the Wesleyan Methodist ministry. He was deeply interested in the welfare of the Indians, whose habits and character he knew thoroughly, and spent his life as a missionary among them. His field covered at different times a considerable portion of the Northwest Territory and his experience made him often a valuable aid to the government in dealing with Indian affairs. He made a tour of eastern Canada and visited New York and Great Britain in 1875. His career was suddenly ended by his death on the plains within a short distance of his camp. He is commonly reputed to have perished in a snowstorm; but his son, who was with him on the journey toward camp, ascribes the end to some unknown physical infirmity as the weather was favorable and his father a master woodsman McDougall is among the most famous of the pioneer missionaries of Canada Consult McDougall, J., 'George Millward McDougall, Pioneer, Patriot and Missionary' (Toronto 1888).

McDOUGALL, John, Canadian missionary, son of George Millward McDougall (qv.). b. Owen Sound, Ontario, 27 Dec. 1842. He was educated at Victoria University, entered the Methodist ministry in 1866 and was ordained in 1872. He was reared among the Indians of the Georgian Bay and Lake Superior regions and before entering the ministry he taught school in the North Western Territory. As a clergyman his work was chiefly among the Indians, where his knowledge of their language and customs made his work unusually effective, and he was also able to render important services to the government in connection with Indian affairs. He was peace commissioner after the uprisings of 1869–70 and 1885. He was also closely associated with the treaties made with the Indians in his district. He was chairman of the Saskatchewan district in 1876 and of the Indian district in 1897. Author of 'A Cree Hymn Book' (1888); 'Forest, Lake and Prairie' (1895); 'Saddle, Sled and Snowshoe' (1896); 'In the Days of the Red River Rebellion' (1900); 'On the Western Trail in the Early Seventies' (1902). D. 15 Jan. 1917.

MacDOUGALL, SIR Patrick Leonard, British general and military author: b. Boulogne-sur-Mer, France, 10 Aug. 1819; d. Kingston Hill, Surrey, 28 Nov. 1894. He was educated at the military academies of Edinburgh and Sandhurst and received his commission as second lieutenant in 1836. He served as regimental officer with the Royal Canadian Rifle regiment at Toronto and at Kingston in 1844-54; served as superintendent of studies at Sandhurst the following year, and in 1855 was sent on a special mession to the Crimea. He was again superintendent at Sandhurst in 1856-58. He was appointed adjutant-general of the Canadian militia in 1865, took an active part in the suppression of the Fenian Raid of 1866 and eceived high commendations for his skilful or-canizing of the militia. In 1873-78 he was head of the intelligence branch of the War Office. Ie was again appointed to the command in Canada in 1878, at the time when relations were trained between England and Russia. He volinteered to organize a body of 10,000 trained soldiers for use whenever and wherever they night be needed, and the acceptance of his offer established the precedent of colonial mili-

tary aid to the empire in time of need. He retired from active service in 1885. Author of 'The Theory of War' (1856); 'Modern Warfare as Influenced by Modern Artillery' (1864); 'The Army and Its Reserves' (1869), etc.

McDOUGALL, William, an Anglo-American psychologist: b. Lancashire, lingland, 1871. He studied at Owens College, Manchester, and at Oxford, Cambridge and Gottingen universities. In 1914, at the outbreak of the World War, he was reader in mental philosophy and fellow of Corpus Christi College, Oxford During the war, he was attached to the medical service of the British army, and at its close returned to Oxford In 1920 he was called to Harvard University to become head of the department of psychology. He remained there until 1927 when he accepted the chair of psychology at Duke University, Durham, N. C. His published works deal chiefly with the problems of national psychology which involve ethical theory, and cannot be discussed in terms of mere science. D. Durham, N. C., 28 Nov. 1938.

MacDOWELL, mäk-dow'či, Edward Alexander, American composer: b. New York, Edward 18 Dec. 1861, d. there, 23 Jan. 1908. Mac-Dowell was Scotch-Irish by birth, if not by training and temperament. It was from his father, a man of pronounced artistic tastes, that the composer inherited or acquired that fine æsthetic sense and that highly sensitive artistic tendency which played so great a part in his life and practically determined the character of his work. MacDowell's musical education was begun at the age of eight, when Juan Buitrago, a friend of the family, gave him his first piano lessons. But not being at all precocious - Mac-Dowell was no musical prodigy—his early progress was neither rapid nor encouraging. It was not until he came to receive instruction from the professional piano teacher, Paul Desvernine, with occasional supplementary lessons from the famous virtuoso, Teresa Carreño, that MacDowell's great musical gifts became manifest. Then, at the age of 15, the lad was taken abroad by his devoted mother for a thorough musical education. Entering the Paris Con-servatory, young MacDowell studied for two years under the two eminent music masters, Marmontel (piano) and Savaid (theory and composition). Going next to Germany, he continued his musical studies at the Stuttgart and Frankfort conservatories, studying piano with Karl Heymann and composition with Joachim Raff, the well-known German composer. Mac-Dowell's unusual talent so impressed both his German teachers that in 1881 they warmly recommended their American pupil for the uniresignation. Nothing but his extreme youthfulness (MacDowell was only 20 at the time) seems to have kept from him this much coveted Frankfort professorship. Failing of this, Mac-Dowell accepted an instructorship at the Darmstadt Conservatory. But his duties as principal piano instructor there were so onerow and his compensation so inadequate that he soon had to resign from this position. Returning to Frankfort, MacDowell devoted himself to composition and private teaching.

It was there, at Frankfort, during his student days, that MacDowell's career as a composer really began. His 'First Modern Suite

for Piano' so impressed the great Liszt, whom MacDowell was induced by Raff to visit at Weimar in 1882, that he had it performed the same year at the Allgemeiner Deutscher Musikverein festival held at Zurich. A year later this suite and its successor, 'The Second Modern Suite,' were published by the famous Leipzig music publishers, Breitkopf and Hartel. Thus verein festival held at Zurich encouraged by his early success, and more especially by the sincere praise of Raff, Liszt and others, MacDowell resolved to settle in Germany permanently. And, save for a short visit to America in 1884 (when he married a former pupil of his, Marian Nevins), he did live there uninterruptedly for 12 years. In 1888 Mac-Dowell returned to America and settled in Boston, which marks a turning point in his life. His European recognition, both as pianist and as composer, naturally had paved the way for his American successes. Almost immediately on his arrival MacDowell made his first public appearance in America in the double capacity of pianist and composer, performing one of his own compositions at a Kneisel Quartet concert (19 Nov. 1888). Shortly after he played his 'Second Piano Concerto' under Theodore Thomas at New York, winning such success with this composition and its afformation of the success with the composition of the success that the composition of the success with the composition of the success that the success t with this composition and its performance that he soon repeated it with the Boston Symphony Orchestra. Thenceforth MacDowell's rise to fame was phenomenal. His services as pianist were in great demand—far greater than his virtuoso ambitions — while his orchestral compositions were performed almost as soon as they were written. Between 1890, when his symphonic poem, 'Lancelot and Elaine,' was performed by the Boston Symphony Orchestra, and 1896 when the same organization placed both his 'Indian Suite' and his 'Piano Concerto' on the same program - which was a most signal honor for a new composer — Mac-Dowell's name appeared prominently and frequently on American orchestral programs. In 1891-92, too, he gave his first piano recitals which further enhanced his American fame. A couple of years later (14 Dec. 1894) Mac-Dowell achieved unprecedented success by his performance, with the Philharmonic Society at New York, of his own 'Second Concerto for Piano and Orchestra.' By 1896, then, his name and fame as pianist and composer were fully established in America, if not also in Europe.

That year another important turning point

That year another important turning point in MacDowell's life was reached. Accepting the chair of music in the then newly-created music department at Columbia University, MacDowell plunged into teaching with such zeal and energy—devoting almost all his time and vitality to his arduous task—that eight years of it (1896–1904) was enough to undermine his health beyond repair. In 1905, one year after MacDowell had resigned his Columbia professorship (owing to a disagreement with the faculty as to the proper place of music in the college curriculum), alarming symptoms of a mental disorder appeared, which soon culminated in hopeless insanity. In this sad state MacDowell lingered till 23 Jan. 1908, when he died in New York, in his 47th year.

The list of MacDowell's compositions is a

The list of MacDowell's compositions is a long one His works extant (the composer himself, in a moment of ruthless self-criticism, destroyed a number of his compositions) include two suites for orchestra (the 'Indian

Suites' Nos. 1 and 2), which are his most pretentious and 'best-known orchestral compositions; two concertos for piano and orchestra, which rank among the best of their kind; four sonatas for piano (the 'Norse,' the 'Keltic,' the 'Eroica' and the 'Tragica'), which alone would have made any composer famous; five symphonic poems ('Hamlet and Ophelia,' 'The Saracens,' 'Lamia,' 'Lovely Alda' and the 'Lancelot and Elaine,' already mentioned), which possess much originality and considerable melodic charm; two most delightful piano suites (the 'Woodland Sketches' and the 'Sea Pieces'), which contain some of MacDowell's most popular and fascinating shorter pieces, and numerous songs of charming simplicity and melodiousness.

As may be inferred from his musical titles, MacDowell is a romantic composer. His music is program music of the poetic, not the descriptive, kind; for MacDowell does not delineate objects, but rather the moods aroused by them. A pupil and disciple of Raff, MacDowell frequently gives his music the woodland flavor. Such titles as 'Forest Idyls,' 'New England Idyls' and 'Woodland Sketches,' among others too numerous to mention, clearly indicate that MacDowell is the Wordsworth of music. His lyrical pieces show the unmistakable influence of Grieg, whose music the American composer greatly admired; while as a romanticist he should be classed with Schumann and Mendelssohn. Consult Gilman, Lawrence, 'Edward MacDowell' (New York 1909), and Page, E. F., 'Edward MacDowell; His Work and Ideals' (ib. 1910).

McDOWELL, Ephraim ("FATHER OF OVARIOTOMY"), American surgeon: b. Rockbridge County, Va., 11 Nov. 1771; d' Danville, Ky., 20 June 1830. He studied medicine at Staunton, Va., and at the University of Edinburgh, then the most famous medical institution in the world. He established himself in practice at Danville, Ky., and became known throughout the Southern and Western States as the best surgeon in his part of the country. In 1809 he performed the hitherto unknown operation of extirpation of the ovary with complete success, and twice repeated the feat before he made an official report of the cases in 1816. His delay in reporting the first case and the seeming impossibility of the performance subjected him to considerable criticism in high quarters both at home and abroad. However, the fact of the success of the operation, several times repeated, is fully substantiated and the method he conceived and carried out has been but little modified, with the exception of assepsis and the use of anæsthetics. In lithotomy he had operated 22 times before 1828 without a fatality. Author of a report of his most famous cases in the Eclectic Repertory and Analytic Review (1817). Consult Gross, S. D., Origin of Ovariotomy (1853); Jackson, J. B., 'Grign of Ovariotomy' (1853); Jackson, J. B., 'Giographical Sketch of Ephraim McDowell' (1875).

McDOWELL, Irvin, American soldier: b. near Columbus, Ohio, 15 Oct. 1818; d. San Francisco, Cal, 5 May 1885. He studied at the College de Troyes, France, and was graduated at West Point in 1838. During the Canadian troubles he was stationed on the Niagara

and on the Maine frontiers, and in 1841 served at West Point as assistant instructor in tactics, becoming adjutant in 1845. In 1845 he went to Mexico as aide-de-camp to General Wood and for gallant conduct at Buena Vista in 1847 was promoted brevet captain, shortly afterward attaining the rank of assistant adjutant-general. Subsequently he was stationed at the War Department in Washington and in 1856 was raised to the rank of brevet major. He was on General Wood's staff at the outbreak of the Civil War and assisted in inspecting and organizing the volunteer troops at Washington. In May 1861 he was made brigadier-general of the volunteers and given command of the Army of the Potomac Constrained by the impatience of the North, McDowell moved in July to meet the enemy and despite his carefully laid plan met a disastrous defeat at Bull Run, 21 July 1861, owing to the imperfect organization of his raw recruits. Shortly after McClellan was given command of the army and McDowell was retained at the head of one of its divisions. In 1862 he was promoted major-general of volunteers and placed in command of the First corps, which became the Army of the Rappa-hannock, stationed to guard Washington. In August 1862 he received command of the Third corps of the Army of Virginia and fought under General Pope at the battles of Cedar Mountain, Rappahannock Station and the second battle of Bull Run, where he performed especially good service. He was removed from the field in September 1862. Considering this action of the War Department a direct reflection upon his military services, he asked for an investigation, the result of which was favorable to him From May to July 1863 he was president of a board appointed to investigate alleged cotton frauds, and during the following 10 months presided over the board for retiring disabled officers. In July 1864 he was placed in command of the Department of the Pacific Coast, and in March 1865 was made brevet major-general in recognition of his gallant services at Cedar Mountain. In 1872 he succeeded General Meade as major-general in the regular army and was in command of various military departments until 1882, when he was retired. The last years of his life were spent in California.

McDOWELL, James, American statesman: b. in Rockbridge County, Va., 1796; d 1851. He was graduated at Princeton in 1817; in 1831 was elected to the Virginia legislature; was governor of that State, 1842-44, and from 1847 to 1851 represented it in Congress. He favored the gradual abolition of slavery, although advocating the claim of State rights. As orator and debater in Congress he bore a prominent part in the proceedings of that body leading up to the Compromise of 1850.

McDOWELL, William Fraser, American M. E. bishop: b. Millersburgh, Ohio, 4 Feb. 1858; d. 26 April 1937. He was educated at the Ohio Wesleyan and Boston universities and was ordained in the Methodist ministry in 1882 He held pastorates at Lodi, Oberlin and Tiffin, Ohio, and in 1890-99 he was chancellor of the University of Denver. He was corresponding secretary of the board of education of the Methodist Church in 1899-1904 and was elected bishop in 1904. He was Cole lecturer at Vanderbilt Uni-

versity in 1910, served as international commissioner of the Y. M. C. A. after 1899 and from 1906 was president of the board of trustees of Northwestern University. He made an official tour of India, China, Japan and the Philippines in 1910–11. Author of 'In the School of Christ' (1910); 'Good Ministers of Jesus' (1917), 'Making a Personal Faith' (1924).

MACDUFF, mak-dui', Scottish thane, or Earl of Fife, a half-mythical personage, commemorated in Shakespeare's play, 'Macbeth' He is said to have been the principal agent in the overthrow of the usurper Macbeth and the restoration of Malcolm Canmore to the throne of Scotland. For this he was granted many privileges, among them that of a place of refuge to which he and his descendants could flee in case of committing unpremeditated munder. This sanctuary, in the form of a cross, stood till 1559, near Newburgh in Fife, in the pass leading to Strathearn. It was then demolished by the Reformers, but its pedestal yet remains.

McDUFFIE, mäk-dŭf'i, George, American statesman and orator: b. in Columbia (now Warren) County, Ga., 1788; d. in Sumter District, S. C., 11 March 1851. He was graduated at South Carolina College in 1813, admitted to the bar in 1814 and in 1818 elected to the South Carolina legislature. From 1821 to 1834 he was a member of Congress, and from 1834 to 1836 governor of South Carolina In 1843 he took his seat in the United States Senate, resigning on account of impaired health in 1846. In his political views and in his Congressional career, he was a close follower of J. C. Calhoun (q.v.), being at the outset a liberal constructionist in constitutional questions, but afterward becoming a strong opponent of the tariff and other economic policies of the government, and also a hold advocate of nullification. Although a supporter of Andrew Jackson (qv) in 1828, he became bitterly antagonistic to him, not only in respect to the tariff and State rights, but especially so on the question of the United States Bank, which, as chairman of the Committee on Ways and Means, he strongly defended against the hostile policy of the President. In 1832, as a member of the South Carolina Nullification Convention, he drafted the address of South Carolina to the people of the United States. He was one of the ablest orators of his day, and his prominence in public affairs was maintained in spite of an early lic affairs was maintained in spite of an early wound received in a duel, from which he suffered for the remainder of his life.

MACÉ, Jean, zhổn mä-sã, French educator and writer: b Paris, France, 22 April 1815; d. there, 13 Dec. 1894. He was educated at the Collège Stanislas, served in the French army, 1842-45, was editor of La République in 1848 and as such was a strong supporter of the Revolution of that year. In 1851, on the coup d'état, he had to withdraw from Paris, and subsequently taught school in Alsace for 10 years. In 1866 he founded a league of instruction in the Belgian manner. He was decorated with the Legion of Honor in 1880, and elected senator in 1883. He was the author of many popular books for young people, the aim of which was mainly educational, among them his best-known work, 'Contes de petit-chateau' (1862), called in the English translation 'Home Fairy Tales'; 'History of a Mouthful of Bread' (1861);

'Servants of the Stomach' (1866); 'France Before the Franks' (1881).

MACE (Lat macir, Greek μάκερ, an East Indian spice), an aromatic spice made from the arillode or false aril which covers the seed of a nutmeg (Myristica fragrans). The yellow external covering of the nutmeg (qv) being removed, the red, rather fleshy, arillode which partially conceals the nutmeg is encountered After drying in the sun for several days this becomes more or less translucent and usually orange yellow and waxy In this form it is largely exported from the Spice Islands, where it is native, and from the West Indies, where it has been introduced into cultivation The powerful but agreeable nutmeg-like odor and flavor characteristic of it are due to a volatile oil which is obtained by distillation for use in perfumery and culinary articles A buttery fixed oil obtained by expression is used after the admixture of the volatile oil under the names nutmeg balsam and nutmeg butter. White mace is obtained from M otoba and red mace from M tingens; also a low grade from M fatua, but this is rarely found in the market Mace is also largely used whole or ground in cookery

MACE, a weapon of war formerly in use in Europe, chiefly among the cavalry, as late as the 16th century, and still used among savage tribes. It consists merely of a staff about five feet long, with a knob at the end. In England the mace is used as an emblem of the officers of state, before whom it is carried. It is made of the precious metals, or of copper, gilt and ornamented. A mace is also carried by the Sergeantin-Arms of the House of Representatives and it is placed to the right of the Speaker.

MACEDO, Joaquim Manoel de, hō-ā-kēn' ma'noo-el dā ma-sā'dō, Brazilian poet, novelist and statesman: b. Sao Joāo d'Itaborahi, 24 June 1820; d Rio de Janeiro, 11 April 1882. He studied medicine, but presently began to write and became professor of national history in the College of Dom Pedro at Rio de Janeiro. He was one of the most prominent of Brazilian authors in the 19th century, and being keenly interested in politics was elected to the Brazilian Chamber in 1854. His works include 'Moreninha,' a novel (1844; 5th ed, revised, 1877); 'O Moço Louro,' a novel of the early stages of the Portuguese conquest (1845); 'O Dous Amores' (1848); 'Vicentina' (1853); 'A Nebulosa,' a poem (1857), his greatest work, consisting of six cantos in unrhymed hendecasyllables; 'Cobé,' a drama; 'Fantasma Branco,' a comedy (1856); 'Nociones de cronografía do Brasil' (1873; translated into French by Halbout), etc.

MACEDO, José Agostinho de Padre, Portuguese poet and author b. Beja, 1761; d. 1831 He received his education in Latin and rhetoric under the Oratorians at Lisbon and became a member of the Augustinian Order in 1778. Temperamentally unfitted for a monastic life he failed to conform to the discipline of the order and in consequence was imprisoned in one convent or another the greater share of the time He eventually abandoned the monastery and his subsequent excesses caused him to be unfrocked in 1792. Intercession on the part of influential friends, however, secured

for him a papal brief which secularized him but restored his ecclesiastical status. He then entered journalism and his preaching gained for him a foremost position among the orators of his day. In 1802 he was appointed a court preacher He established and contributed to a large number of journals and was famous for his keen satire and wit, although he also gained the reputation of being the "chief libeller of Portugal" He was a staunch adherent of absolutism and seriously advocated the massacre of all opponents of Miguel. He was censor of books in 1824-29, when he resigned upon being threatened with proceedings by his own political party, his support having become harmful to its interests. He had gained a considerable reputation through his verse, which introduced into Portugal didactic and descriptive poetry, and his 'Meditation' (1813) was a notable production His ambition then led him to covet the place held by Camoens as Portugal's leading poet, and in 1814 he published 'Oriente' for which he unwisely chose the subject of Camoens' 'Lusiads,' the discovery by Gama of the sea route to India. While the verse itself was not without strength and grace the epic, as a whole, was flat and insipid, and failed utterly to cause its author to outshine Camoens. Macedo then published his 'Censura dos Lusiados,' in which he bitterly attacked Camoens, and brought upon himself Bocage's scathing 'Pena de Talião.' His 'Os Burros' is no less pitiless in its betrayal of his own evil character than shameless in its excoriation of men and women in all grades of society, living or dead He translated the 'Odes' of Horace and made several attempts at drama but these are not particularly notable. He was at his best in his odes to Wellington and to Alexander, and in the verse in his 'Lyra anacreontica' There is some doubt concerning 'A Demonstration of the Existence of God' as being from his pen, but it is usually credited to him and shows high ability. He was notorious for his ingratitude, and merciless in his satire, but he died with many friends and a great reputation, although his fame was of brief duration. Consult T. Braga's edition of 'Memorias para la vida intima de José Agos-tinho de Macedo' (1899); 'Cartas e opusculos' (1900).

MACEDONIA, măs-è-dō'nĭ-à, a territory in the Balkan Peninsula (q.v.). Never having had a separate existence as a political or administrative unit in modern times, it has no pre-cisely defined boundaries. The territory generally considered to be within Macedonia (approximately 25,000 square miles) is bounded on the east by the Mesta River and the Rhodope Mountains, on the north by the Rila Mountains and the Crna Gora, on the west by the Shar Mountains and the Ohrid-Prespa lake district, and in the south by the Vistritsa (Haliakmon) River and the Aegean Sea. It is a mountainous area except in its southern and eastern sectors, which are the most productive agricultural lands in modern Greece. The strategic significance of Macedonia has been great throughout the course of history, for it is crossed by two major European trade routes which link the Aegean Sea with central Europe and with the Adriatic. These routes meet near the mouth of the Vardar River at the port of Salonika (Thessalonike), the only large city in Macedonia. It is the natural commercial port for the trade of a large part of the Balkan Pennisula. In the low-lying areas of eastern and southern Macedonia near Salonika the chief crops are cereals and tobacco, of which a considerable surplus is produced for consumption outside Macedonia. In the northern and western parts the climate and the economy are like those of the neighboring areas of the central Balkan Pennisula; crop yields, principally cereals, are low and living standards are near the subsistence level.

In ancient times Macedonia was a monarchy which had its beginnings in the coastal area at the head of the Thermaic Gulf, now the Gulf of Salonika (Thermarkos). King Philip II of Macedonia in the 4th century BC. extended his kingdom to include all the territory now known as Macedonia, including the Peninsula of Chalcidice (Khalkıdıke). The district which he conquered from Thrace, lying between the Strymon (Struma) and the Nestos (Mesta) rivers was called *Macedonia adjecta* Under Philip and his son, Alexander the Great, Macedonia conquered all of Greece and then the greater part of the civilized world After Alexander's death in 323 BC, the immense Macedonian Empire was divided; in 197 BC, after a resounding defeat in battle by the Romans, Macedonia lost even its dominion over Greece and returned to its ancient limits. After further nulitary defeats it became a Roman province in 146 BC As such it is mentioned in the New Testament, and Saint Paul's letters to the Thessalonians and Philippians are addressed to Macedonian Christians. In 395 AD Rome lost possession of Macedonia and it became a part of the Byzantine Empire, which held it, except for intervals when it fell under the control of the Bulgars and the Serbs, until the conquering Ottoman Turks wrested it from the feeble Byzantine emperors in the 14th and 15th centuries.

The earliest known inhabitants of Macedonia stemmed from two major groups, the Thracians and Illyrians, apparently with a large admixture of Dorians Migrations during the course of the Middle Ages completely changed the character of the population. By the time of the Turkish conquest the original inhabitants had been pushed out or absorbed by the masses of Slavs who settled in Macedonia. The province had become predominantly Slavic except in the coastal area where Greeks had established themselves These two groups have remained the basic elements in the population Minor elements which setttled there at various times and are there today include the Albanians, who filtered into Macedonia from the west; Kutzo-Vlachs, who speak a dialect of Rumanian and are principally a shepherd people; Turks, who formed the privileged class during the period of Ottoman rule and owned much of the land; gypsies; and Spanish-speaking Jews, concentrated in Salonika, whose forbears found refuge in the tolerant Ottoman Empire after their expulsion from Spain. Although the number of nationalities present in Macedonia has added to the complexities of the Macedonian «problem,» the basic factors in it have been the antagonism between Slavs and Greeks and the dispute between Serbs and Bulgarians over the Macedonian Slavs. Until the rise of nationalism in the 19th century these conflicts did not arise in acute form. Then, however, Serbian, Bulgarian, and Greek nationalists

began to stake out conflicting claims to Turkish territory. The Macedonian Slavs, claimed as blood brothers by both Serbs and Bulgarians, numbered approximately 1,150,000, about one half the total population of Macedonia. In language they were neither Serbs nor Bulgarians but were closely related to both By 1870, however, their linguistic and cultural ties were much closer with Bulgaria, which like Macedonia was still under Turkish administration, than with Serbia, which enjoyed political autonomy. In that year the Bulgarians secured the establishment at Constantinople of an autonomous Bulganan Orthodox Church, or Exarchate, the jurisdiction of which extended to Macedonia. The treaty of San Stefano, which was forced on defeated Turkey by Russia in 1878, provided for the inclusion of Macedonia within the boundaries of an autonomous Bulgarian principality. The Treaty of Berlin in the same year revised that settlement and left Macedonia under direct Turkish rule with a promise of reforms which were to improve the lot of the population. Since that time Bulgaria has regarded Macedonia as lost national territory which must be regained. During the decades following the Treaty of Berlin the Turkish administration in Macedonia went from bad to worse, and the neighboring states (Bulgaria, Serbia, and Greece) engaged in bitter rivalry to win the allegiance of the Macedonian population by propaganda and by more violent methods. In 1893 the Internal Macedonian Revolutionary Organization (I.M.R.O.) was founded at Resan in Macedonia with a program of independence. Shortly afterward a Supreme Macedonian Committee was formed in Bulgaria with a program of liberating Macedonia from the Turks and annexing it to Bulgaria. These organizations hoped that the disorder they were helping to create in Maccolonia would provoke Turkish reprisals against the population and thus would force the European powers to intervene. In 1902-03 a widespread insurrection broke out and was brutally crushed by the Turks. Thereupon Russia and Austria, the two great powers most directly interested, drew up a scheme of reforms (1903) which Turkey was forced to accept. It provided for the inspection and supervision of certain aspects of the administration by representatives of the European powers. This scheme never functioned efficiently, partly because the neighboring Balkan States, desirous of a more drastic solution of the problem, did not intend that it should. In 1912 they formed a military alliance and attacked Turkey with the aim of eliminating the Ottoman power from the soil of Europe. In this they were nearly successful; they defeated the Turkish armies, overran Macedonia, Albania, and a part of Thrace, but could not agree over the division of the Macedonian spoils. The Greeks, who had occupied Salonika, and the Serbs, who had taken over most of the remainder of Macedonia, joined to defeat the Bulgarians in the Second Balkan War in 1913 and divided the disputed territory between themselves, leaving only a small corner of it to Bulefficiently, partly because the neighboring Balkan selves, leaving only a small corner of it to Bulgaria. This settlement was confirmed by the Treaty of Bucharest (1913). (See BALKAN LEAGUE; BALKAN WARS.) Bulgaria's entry into the First World War in 1915 on the side of the Central Powers was in part motivated by the desire to acquire Macedonia. When the Serbian Army was driven to the Adriatic coast in that

same year, the Bulgarians occupied Serbia's share of Macedonia and held it until the victory of the Allies in 1918. The Salonika front was the scene of the great Allied breakthrough which knocked Bulgaria out of the war and made untenable Germany's entire position in the south-east. The territorial settlement of 1919 restored, with some slight modifications, that of 1913. Yugoslavia and Greece were confirmed in possession of all of Macedonia except the Petrich district which remained in Bulgaria During the 1920's, as a result of exchanges of populations between Greece and Turkey and between Greece and Bulgaria, Greek Macedonia became over 90 per cent Greek in population It presented a far less acute problem than Yugoslav It pre-Macedonia which contained over 650,000 Slav inhabitants whom Bulgaria claimed as Bulgarians but whom Yugoslavia officially designated as «South Serbians» Severe treatment of this population by the Yugoslav government, coupled with terroristic outrages and the violation of the frontier on the part of bands organized on Bulgarian soil, made normal relations between the two countries very difficult. In Macedonia itself there were partisans of Bulgaria, of Yugoslavia, and of the idea of an independent Macedonia which had persisted since the early days of revolutionary activity against the Turks. Some of the tension was removed from the Macedonian question after the Bulgarian government broke up the terroristic Macedonian organization in Bulgaria in 1934 and signed a treaty of friendship with Yugoslavia in 1937. However, Bulgaria did not hesitate to occupy Yugoslav Macedonia when Germany crushed the Yugoslav Army in 1941 and to treat it as liberated Bulgarian territory. At the same time Bulgaria occupied the eastern part of Greek Macedonia between the Struma and Mesta rivers and began to resettle Bulgarians there. Having made these territorial gains with German aid, Bulgaria was reluctant to give them up and remained loyal to its alliance with Germany long after German military fortunes began to decline, partly because it saw no chance at all to maintain the new «Greater Bulgaria» in the event of a United Nations victory.

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MACEDONIAN, The. See United States and Macedonian, Battle of.

MACEDONIANS, followers of Macedonius, author of the Macedonia heresy; also called Pneumatomachi, or «Adversaries of the Spirit» The Macedonians came into existence toward the decline of the Arian controversy, when Macedonius became patriarch of Constantinople (341), and taught that the Holy Ghost was «subordinate to the Father and to the Son, unlike to them in substance, and a creature.» He was a semi-Arian; was deposed by the Arians in 360; and his special tenets condemned at the Council of Constantinople in 381. In that council the clauses defining the nature of the Holy Ghost were added to the Nicene Creed.

MACEIÓ, mä-sā-yō', Brazil, formerly Ma-CAYO, city and capital of the state of Alagôas, on the Atlantic Coast, 135 miles southwest of Pernambuco. The city has a cathedral, lyceum, government and other buildings. It has manufactures of machinery and cotton goods, and considerable ship-building is carried on here. Cotton, sugar and rum are the chief items of export Maceió is the seat of a United States consular agent. Pop. 129,000.

McENTEE, Jervis, American painter: b. Rondout, NY, 14 July 1828; d. there 27 Jan. 1891. He made his first contribution to the American Academy of Design in 1853, was elected associate of that institution in 1860 and academician in 1861. He belonged to the "Hudson River School" of artists and his favorite subject was the autumn type of landscape, although his work is by no means confined to one phase or season. Among his paintings are The Melancholy Days Have Come (1860); Sea From Shore (1873); Old Mill in Winier (1874); Clouds (1879); Glimpse of Hunter Mountain (1886); A Cliff in the Catskills (1888). His Autumn Landscape hangs in the Metropolitan Museum, New York.

MACEO, mä-sā'ō, Antonio, Cuban patriot: b Santiago de Cuba, 14 July 1848; d. near Mariel, 2 Dec. 1896 He joined the insurgent army as a private in 1868, and his natural military ability and personal magnetism as a leader soon brought him to the front, making him second only to Gomez. Under his skillful leadership Martinez Campos was defeated at Demajayabo and at La Galleta; his campaign in Baracoa in 1878 evidenced masterly generalship, as did also his utter rout of Santacledes at San Ulpiano. Maceo alone of all the Cuban generals refused to sign the Peace of Zanjón and made a tour of the United States and other countries in America seeking support for the cause of Cuban independence. He was the first of the Cuban leaders to land in 1895, and his achievements in the campaign are among the most brilliant feats in the history of Cuba's long struggle for independence. While crossing the trocha between Majana and Mariel, attended only by his staff, he was surrounded by a Spanish force and killed.

MACEO, José, hō-sā, Rafael, Cuban patriot: b. Santiago de Cuba, 1846; d. La Loma del Gato, Cuba, 5 July 1896. He was a brother of Antonio Maceo (q.v) and took a conspicuous part in the Rebellion of 1868–78. He remained in Santiago de Cuba after the Peace of Zanjón, which he with his brother refused to sign. He lived in Costa Rica from 1885 until the outbreak of the rebellion in Cuba in 1895, when he raised a large force which he commanded with signal success. He was killed in a furious engagement at La Loma del Gato in which the Cubans were finally victorious. For an adequate account of the importance of the Maceo brothers consult General Weyler's Mi Mando en Cuba, 10 Febrero 1896 a 31 Octubre 1897 (5 vols., Madrid 1910–11).

MACERATA, mā-chā-rā'tā, central Italy, (1) an episcopal city, capital of the province of the same name, picturesquely situated on an eminence, 1,207 feet high, between the Apennines and the sea, 21 miles south of Ancona. It is encircled by walls, pierced by six gates, has a cathedral, provincial palace and theatre on the central public square, town-hall (13th century), a college founded in 1290, museum, etc. Terra cotta, chemicals and matches are among its manufactures. Pop of commune

26,000. (2) The province has an area of 1,032 square miles.

Macewen, Walter, American artist: b. Chicago, 1858; d. New York, 20 March 1943. He studied under Cormon and Tony Robert-Fleury in Paris, and lived much abroad. His work includes landscapes, portiaits, decorative panels and figure subjects and is marked by excellent sense of line and strong feeling for color. He executed panels for the Liberal Arts Building at the Columbian Exposition, Chicago, and for the Congressional Library, Washington. He has been awarded numerous prizes, including gold medals at Berlin, Vienna and Munich, the Lippincott prize at Philadelphia and the Harris prize at Chicago. He is an officer of the Legion of Honor and of the Belgian Order of Leopold. He served on the International Jury of Awards at the Panama Exposition in 1915. Many of his paintings have been acquired by public galleries. Among them are 'Sunday in Holland' (Luxembourg); 'An Ancestor' (Corcoran Gallery, Washington); 'Judgment of Paris' (Art Institute, Chicago)

McFARLAND, mak'far'land, John Horace, American master printer and civic improvement expert: b. McAlisterville, Juniata County Pa., 24 Sept. 1859. He was privately educated, learned the printing business and in 1878 established his own business, which after several changes was incorporated as the J. Horace McFarland Company in 1891. In 1890–93 he printed and was a contributor to American Cardening, and in 1901–04 he printed Country Life in America, also contributing articles and photographs. (He edited the 'Beautiful America' department in The Ladies' Home Journal in 1904–07. He is an active member of various leagues for improving and beautifying American cities and villages, is an ardent advocate of national parks and forest conservation and organized a campaign for the preservation of Niagara Falls. He edited the American Rose Annual in 1916–18; furnished photographic illustrations for Mabel Osgood Wright's 'Flowers and Ferns in their Haunts,' and assisted in illustrating and printed Bailey's 'Standard Cyclopedia of Horticulture.' Contributor to numerous periodicals; author of 'Photographing Flowers and Trees' (1902); 'Laying Out the Home Grounds' (1915), 'My Growing Garden' (1915); 'The Rose in America' (1923).

McFARLAND, John Thomas, American Methodist clergyman: b. Mount Vernon, Ind, 2 Jan. 1851; d. 22 Dec. 1913 He was educated at the Iowa Wesleyan University, Simpson College, Iowa, and at Boston University, and was ordained in the Methodist ministry in 1873. He filled pastorates at Millersburg and Sweetland Centre, Iowa; Portsmouth, R. I.; Elmwood and Peoria, Ill.; was president of the Iowa Wesleyan University in 1884-91; pastor of Grace Church, Jacksonville, Ill, of New York Avenue Church, Brooklyn, and First Church, Topeka, Kan He was editor of the Sunday School literature of the Methodist Church from 1904 until his death. Author of 'Preservation vs. The Rescue of the Child'; 'The Book and the Child'; 'Etchings of the Master.'

MACFARLANE, Alexander, American mathematician: b. Blairgowrie, Scotland, 21 April 1851; d. 28 Aug. 1913. He was graduated at Edinburgh University in 1875, taking

his DSc. in 1878, and in 1881 was appointed examiner in mathematics there. He became professor of physics at the University of Texas in 1885 and from 1897 was lecturer on mathematics at Lehigh University. He was a Fellow of the Royal Society of Edinburgh and a member of the Washington Academy of Sciences, Author of 'Algebra of Logic' (1879), 'Physical Arithmetic' (1885); 'Papers on Space Analysis' (1894); 'Bibliography of Quaternions and Albed Mathematics' (1904), etc.

Macfarren, Sir George Alexander, English composer: b London, England, 2 March 1813; d. there, 31 Oct. 1887. He was educated at the Royal Academy of Music, where in 1837 he became a professor of harmony and composition and in 1875 principal. In the same year he was elected professor of music in Cambridge University. Among his compositions are the operas (The Devil's Opera) (1838); (Robin Hood) (1860), and the oratorios (St. John the Baptist) (1873); (King David) (1883), etc. He also wrote several valuable treatises: (Harmony) (1860); (Counterpoint) (1879), etc. He was knighted in 1883. In 1800 he became blind and his wife thereafter wrote his compositions from his dictation

McFAUL, James Augustine, American Roman Catholic prelate: b. Larne, County Antiim, Ireland, 6 June 1850; d. 16 June 1917. At an early age he attended Saint Vincent's College, Reatty, Pa, finishing his classical studies at Saint Francis Xavier's College, New York City, and subsequently pursuing his theological course at Scton Hall, South Orange, N. J. He was ordained priest 26 May 1877, Orange, Paterson, Jetsey City, Newark and New Brunswick, N. J., being in turn the scene of his first labors in the ministry. In 1878 he was named assistant at Saint Mary's Church, Trenton, N. J., and afterward pastor of the church of Our Lady Star of the Sea, Long Branch, N. J. Some years later he assumed the rectorship of the Cathodral at Trenton, and then became secretary, chancellor and vicar-general of the diocese. On the death of Bishop O'Farrell in 1894 Father McFaul was chosen his successor, and was consecrated at Trenton 18 October of that year. Noteworthy among his achievements were the erection of an orphan asylum at Hopewell and of a home for the aged at Laurence-ville, N. J., also a day nursery in Trenton. He is the author of some excellent articles on 'American Citizenship,' published a volume of pastoral letters, etc., and was a leading power in forming the Saint Michael's Diocesan Union. However, he is perhaps best known as the founder of the Federation of Catholic Societies and the reorganizer of the Ancient Order of Hibernians, American branch.

MacFLECKNOE, or A SATIRE UPON THE TRUE-BLEW PROTESTANT POET, T. S., a satire by John Dryden (q.v.), published in 1682, in which Thomas Shadwell has the principal part. Dryden here introduced the name of Richard Flecknoe (1600-1678?), who by the author is represented as an Irish priest famed for his bad verse, but who is described by Andrew Marvell as "an English priest at Rome." Flecknoe was disliked by Dryden because of the former's abuse of the players and his attacks on their morality or rather absence of it. The name served also as a

stalking-horse from behind which Shadwell might be pilloried as the adopted son and heir of Flecknoe. The satire served Pope as model for his 'Dunciad' The authorship of 'Mac-Flecknoe' long disputed and attributed to Dryden, was called in question in 1918 when there appeared a possibility that it might have been written by John Oldham, Dryden's friend A manuscript of the latter's poems in the Bodleian Library contains 'MacFlecknoe,' but Dryden claimed authorship of the piece and his friend Oldham never did. Consult Belden, H M, 'The Authorship of MacFlecknoe' (in Modern Language Notes, December 1918).

McFLIMSEY, mak flim'zi, Flora, the heroine of the once famous poem 'Nothing to Wear,' by William Allen Butler (qv). It was published in 1857 and became immediately popular

MacGAHAN, māk-ga'hān, Januarius Alo-ysius, American journalist and war correspondent: b near New Lexington, Ohio, 12 June 1844; d Constantinople, 9 June 1878 He fol-lowed different callings in Western States, then went to Europe and studied law in Brussels Upon the outbreak of the Franco-German War in 1870 he went to the field as correspondent of the New York Herald, and was with Bourbaki's army He visited Bordeaux and Lyons and his interviews with clerical, monarchical and republican leaders attracted wide attention. He was the only newspaper correspondent in Paris during the whole period of the Commune and narrowly escaped death In 1873, after heroic exertions, with extreme hardships, he reached the Russian army before Khiva, and sent to the Herald reports of the campaign which won for him high admiration both here and in Europe, his account of the capitulation of the city being regarded as "a masterpiece of military journalism." Returning to America, he went to Cuba to report on the Virginius affair, then to Spain, upon the Carlist uprising, where he spent 10 months with the army of Don Carlos, was captured by the Republicans, mistaken for a Carlist, condemned to death and saved by the intervention of the United States Minister. He then went to England, and in 1875 accompanied the Arctic expedition on the Pandora In 1876 he joined the Turkish army, in the service of the London Daily News, and did memorable work in his description of the Bulgarian atrocities, his accounts standing approved before the world in face of all attempts to discredit them. In behalf of Bulgaria he appealed to Russia, was at the front in the Russo-Turkish War that followed, and was hailed as a chief instrument of Bulgaria's resulting independence. While nursing a friend he contracted a fever which in a few days caused his death. In 1884 the Ohio legislature secured the removal of his body from its foreign grave to its final resting-place at New Lexington He wrote 'Campaigning on the Oxus, and the Fall of Khiva' (1874); 'Under the Northern Lights' (1876), and 'Turkish Atrocities in Bulgaria' (1876).

McGEE, ma-gē', Anita Newcomb, American physician: b. Washington, D. C., 4 Dec. 1864. She is a daughter of Simon Newcomb (qv); was educated at Newnham College, Cambridge, England, at the University of Geneva and at other institutions in Europe; also graduated in medicine at Columbian (now George Washington) University, 1892, and took

a post-graduate course in gynecology at the Johns Hopkins Hospital. From 1892 to 1896 she practised in Washington. In 1888 she married W J. McGee (qv.). She has held promment positions in the National Society of the Daughters of the American Revolution, and from April to September 1898 was director of its hospital corps, which selected women nurses for army and navy In August 1898 to December 1899 she was acting assistant surgeon in the United States army, being the first woman to hold such a position, and was assigned to duty in the surgeon-general's office, where she organized the army nurse corps. When the Congress approved this work by making the nurse corps of trained women a permanent part of the army the pioneer stage was passed, and she resigned 31 Dec 1900. In 1904, acting as president of the Society of Spanish-American War Nurses and as representative of Philadelphia Red Cross Society and by agreement with Japanese government, took a party of trained nurses formerly in United States army to serve in the Japanese army for six months gratuitously. Was appointed by the Japanese Minister of War as supervisor of nurses, which placed her in the same rank with officers of the Japanese army, and inspected and reported on relative nursing conditions. She is a recipient of the Japanese Imperial Order of the Sacred Crown and of a special Japanese Red Cross decoration and two Russo-Japanese War She is a member of the Association of Military Surgeons of the United States and of the Spanish War Veterans, being the only woman eligible She lectured on hygiene at the University of California in 1911, and has lectured throughout the United States and written for various magazines

McGEE, Thomas D'Arcy, Canadian journalist and politician: b. Carlingford, Ireland, 13 April 1825; d. Ottawa, Ontario, 7 April 1868. In 1842 he emigrated to the United States In 1845 he returned to Ireland, but complicity in the Young Ireland movement and an abortive attempt to raise rebellion among the Glasgow Irish caused him to seek refuge in the United States in 1848. McGee then edited the New York Nation for two years, became converted to constitutional methods for the redress of Irish grievances and went to Canada in 1857 where he was editor of the The New Era He entered Parliament in 1857; was president of the Council 1864-67 and Minister of Agriculture on the carrying through of confederation, which his eloquence and persuasiveness had done much to popularize. His assassination was the result of his opposition to the Fenian movement He published 'History of Ireland' (1862); 'Speeches and Addresses of the British-American Union' (1865), etc.

McGEE, W J, American scientist: b. in Dubuque County, Iowa, 17 April 1853; d. Washington, D. C., 4 Sept 1912 He was self-educated, and from 1873 to 1875 surveyed land and practised in the courts. He also improved several agricultural implements, some of which he patented. In 1877-81 he made geologic and topographic surveys of northeastern Iowa, and for the United States Geological Survey he surveyed and mapped 300,000 square miles in the southeastern part of the country, and performed many other important services in the depart-

ments of geology, ethnology and anthropology. From 1893 to 1903 he was ethnologist in charge of the Bureau of American Ethnology. He was president of the American Anthropological Association, chief of the Department of Anthropology and Ethnology of the Louisiana Purchase Exposition and associate editor of the National Geographic Magasine. He wrote 'Geology of Chesapeake Bay' (1888); 'Pleistocene History of Northeastern Iowa' (1891); 'The Lafayette Formation' (1892); 'Potable Waters of the Eastern United States' (1894); 'The Siouan Indians' (1897); 'Primitive Trephining in Peru' (1898); 'The Scri Indians' (1899); 'Primitive Numbers' (1901); 'Soil Erosion' (1911); 'Wells and Subsoil Water' (1913), and many scientific memoirs.

McGIFFERT, Arthur Cushman, American theologian b. Sauquoit, N Y., 4 March 1861; d. 25 Feb. 1933. He was graduated at the Western Reserve College in 1882, and at Union Theological Seminary in 1885, and continued his studies at the universities of Berlin and Marburg, Germany, and in France and Italy. In 1888–90 he was instructor in Church history at Lane Theological Seminary, Cincinnati, and professor there 1890–93, in 1893–1926 he was professor of Church history and in 1917–26 president of Union Theological Seminary, New York. In 1897 he published 'A History of Christianity in the Apostolic Age,' and because of criticism and threatened denominational disturbance, involving his possible trial for heresy, to which this book gave rise, he withdrew from the Presbyterian ministry, and later, while still retaining his professorship, joined the Congregational Church His other publications include (Dialogue Between a Christian and a Jew,' doctor's thesis (1888), and a translation of Eusebius' (Church History,) with prolegomena and notes (1890); 'The Apostles Creed' (1902); 'Protestant Thought Before Kant' (1911); 'Martin Luther, the Man and his Work' (1911); 'The Rise of Modern Religious Ideas'; 'The God of the Early Christians' (1924).

McGIFFIN, ma-gif'in, Philo Norton, American naval officer: b. Washington County, Pa., 1863; d. New York, 11 Feb. 1897. He was graduated in 1882 at the United States Naval Academy and was stationed in China, and at the outbreak of the war between China and France was permitted to resign from the United States navy to enter the service of China. He established a naval academy at Wei-hai-wei, of which he had charge. When the China-Japan War broke out he was placed in command of the Chen Yuen, and was the first American or European to command a modern warship in action He was in command at the battle of Yalu River, in which action he was so severely injured that he afterward shot himself at a hospital in New York.

McGILL, ma-gil', James, Canadian philanthropist b. Glasgow, Scotland, 6 Oct. 1744; d. Montreal, 19 Dec. 1813. He was educated in Glasgow and in 1770 removed to Canada, where he engaged in the northwest fur-trade, afterward becoming a merchant in Montreal. McGill was a member of the Parliament of Lower Canada and held the rank of brigadier-general in the War of 1812. He used much of his wealth in philanthropic work and at his death founded McGill College (q.v.) in Montreal.

McGILL, John, R. C. bishop: b. 1809; d. 1872. Admitted to the bar, he practiced law in Bardstown, Ky.; studied theology and was ordained priest 1835; in 1850 he was named bishop of Richmond, Va., and in November of that year was consecrated at Bardstown by Dr. Kenrick,

McGILL COLLEGE AND UNIVER. SITY, in Montreal, Canada, was founded in 1811 by James McGill (q.v.). By will he left an estate known as the "Burnside Estate," which contained 47 acres of land and a fine manor house, near Montreal, and £10,000 to the "Royal Institution for the Advancement of Learning," for the establishment of a university in Lower Canada (province of Quebec). The bequest was valued at the time as worth about \$120,000 It was stipulated that one of the calleges of the university should be known. the colleges of the university should be known in perpetuity as McGill College. McGill University includes a group of schools or colleges and is affiliated with Cambridge, Oxford and Dublin universities. Many generous benefactors have supplied means for the foundation of various departments or faculties. The late Lord Strathcona and Mount Royal erected and endowed the Royal Victoria College for Women. This is a residential college, and is only one of many gifts from the same donor, the last of which was a donation of \$620,000 for the erection of a medical building. Sir William Macdonald creeted, equipped and endowed the Macdonald Chemistry and Mining Building, the Macdonald Physics Building and the Macdonald Engineering Building. He also gave \$200,000 endowment to the Law School, besides other large donations. He has been the chief benefactor of the university. Peter Redpath gave the University Library and the Peter Redpath Museum. The degrees conferred by the university are B.A. and B.Sc., in the Faculty of Arts, and to both men and women; B.C.L. and D.C.L. in the Faculty of Law; B. Arch. and B.Sc., in the Faculty of Applied Science; M.D., C.M. and D.D.S., in the Faculty of Medicine; B.S.A. in the Faculty of Agriculty. ment of Music and Mus. Doc. in the Depart ment of Music and M.A., M.Sc., D.Sc., and D.Litt. in the Graduate School. There are three affiliated theological colleges which adjoin the university grounds. The supreme authority rests with the Crown and is exercised by the governor-general of Canada. The governors, 25 in number manage the forecast acceptance of the contract of the cont 25 in number, manage the finances, appoint professors, pass statutes for the general government of the university and attend to other important matters. The president of the board of governors is ex officio, the chancellor. The vice-chancellor is the principal, who is the head of the academic department and chief administrative officer. The Senate is the supreme academic authority of the university and has control over admission courses of study dis control over admission, courses of study, discipline and degrees. The enrolment in university courses for 1938–39 was 3,275, and in other departments of study 1,840. Annual income is well over \$2,000,000. Plant value is estimated at some \$14,500,000.

MacGILLICUDDY'S (ma-gil-i-kūd'i) REEKS, Ireland, a picturesque mountain range, in County Kerry, extending for 13½ miles from the lakes of Killarney on the east to Lough Carra on the west, and covering an area of 28 square miles. It is the loftiest mountain range in Ireland, culminating in Carrantuohill, 3,414 feet high.

McGILLIVRAY, ma-gil'i-vrā, Alexander, chief of the Creek Indians: b in Alabama about 1740; d. Pensacola, Fla., 17 Feb 1793. His father was a Scottish merchant of good family and his mother a half-breed He received a good education at Charleston, S C; was placed in a mercantile establishment in Savannah; but soon returned to the Creek country, where he became partner in a large trading house and rose to a high position among the Indians. After the death of his mother, a member of the ruling stock, he became chief of the Creeks, having received a call from a formal council, and styled himself Emperor of the Creek Nation During the Revolution the Mc-Gillivrays, father and son, were zealous adherents of the royal cause, the former holding the tank of a colonel in the British service. After the war Alexander McGillivray, in behalf of the Creek confederacy, entered into an alli-ance with Spain, of which government he was made a commissary, with the rank and pay of colonel. In 1790 he was induced by President Washington to visit New York, where he eventually signed a treaty yielding certain disputed lands lying on the Oconee. He was also persuaded to withdraw from Spanish service and was rewarded with an appointment as agent for the United States, with the rank and pay of brigadier-general

McGILVARY, Evander Bradley, American linguist and philosopher. b Bangkok, Siam, 19 July 1864, of American parents He was graduated from Davidson College in 1884 and from Princeton in 1888 He was appointed as instructor in the classics at Bingham School in 1884, and in 1889-90 studied at Princeton Theological Seminary. From 1891 to 1894 he was translator for the Presbyterian Board of Foreign Missions in Siam, and in 1894 began graduate work at the University of California, where he later became assistant professor. In 1899 he was appointed Sage professor of ethics at Cornell. In 1905 he was appointed professor of philosophy at the University of Wisconsin. In 1910-11 he was president of the Western Philosophical Association and in 1912-13 of the American Philosophical Association. He has translated the Gospels of Matthew, Luke and John, and the Acts of the Apostles into the Lao dialect of Siamese. Has contributed to various philosophical journals and to encyclopædias

McGLYNN, ma-glin', Edward, American Roman Catholic clergyman: b. New York, 27 Sept. 1837; d. Newburg, N. Y, 7 Jan. 1900 He was educated at the College of the Propaganda in Rome, and from 1866 was pastor of Saint Stephen's Church in New York. He favored the education of children by the State rather than in parochial schools and in 1886 warmly supported the candidacy of Henry George for the mayoralty, thereby bringing upon himself the censure of the Church. He was summoned to Rome to exculpate himself, but refused to go, pleading his ill-health. Persisting in his refusal he was excommunicated in 1887. He was one of the founders of the Anti-Poverty Society and was its president. In 1893, after a hearing before the Pope's delegate, Monsignor Satolli, the ban of excommunication was re-

moved, after signing a document drawn up by the apostolic delegate to the effect that his economic views were not in conflict with the Catholic faith. He was in charge of Saint Mary's parish in Newburg at his death.

McGOVERN, ma-göv'ern, John, American author: b. Troy, N. Y., 18 Feb. 1850; d. 17 Dec. 1917. He was connected for 16 years with the Chicago Tribune, and after 1880 was engaged in literary work and lecturing chiefly on great writers and historical characters. In the action of S. E. Gross, author of the play 'The Merchant Prince of Cornville,' against Edmond Rostrand, author of 'Cyrano de Bergerac,' he acted as literary expert for the former, furnishing in the case over 700 exhibits contaming innumerable parallels between the two dramas. The United States Court at Chicago issued a decree in 1902 sustaining the claim of Gross to priority of authorship and forbidding the representation of 'Cyrano de Bergerac' in this country. McGovern's numerous writings include 'The Empire of Information' (1880); 'A Pastoral Poem' (1882); 'The Toiler's Diadem' (1885); 'Under the Open Sky' (1890); 'King Darwin,' a novel (1894); 'American Statesmen' (1898); 'Famous Women of the World' (1898); 'John McGovern's Poems' (1902); 'The Golden Legacy'; 'History of Grain' (1913); 'Trees' psychologically considered; 'Hospitality'; 'In Bohemia,' etc.

'Hospitality'; 'In Bohemia,' etc.

MACGRATH, mă-grăth', Harold, American journalist and novelist: b. Syracuse, N. Y., 4
Sept. 1871. He was educated in Syracuse and was engaged in journalism from 1890 He wrote 'Arms and the Woman' (1899); 'The Puppet Crown' (1901); 'The Grey Cloak' (1903); 'The Princess Elopes' (1905); 'Enchantment' (1905); 'Hearts and Masks' (1905); 'Half a Rogue' (1906), 'The Watteau Shepherdess,' an operetta (1906); 'The Best Man' (1907), 'The Enchanted Hat' (1908); 'The Lure of the Mask' (1908), 'The Goose Girl' (1909); 'A Splendid Hazard' (1910); 'The Carpet from Bagdad' (1911); 'Deuces Wild' (1913); 'Pidgin Island' (1914); 'Voice in the Fog' (1915); 'The Drums of Jeopardy' (1920); 'The Ragged Edge' (1922); 'The World Outside' (1923); 'The Sporting Spinster' (1925); 'The Green Complex.' He died 29 Oct. 1932.

McGRATH, Patrick Thomas, British-American journalist: b. Saint John's, Newfoundland, 16 Dec. 1868; d. 1929. Was educated at the Christian Brothers' School, Saint John's, and in 1889 became a reporter on the Saint John's Evening Herald. He was promoted acting editor in 1893, and in 1894–1907 was editor. He established the Evening Chronicle, which in 1912 was united with the Herald, and became president of the company. He acted as Newfoundland correspondent of the London Times after 1904 and was an extensive contributor to both British and American periodicals. He was president of the Legislative Council of Newfoundland after 1915. He assisted in the preparation of the colony case concerning the French and American fisheries and was, the colony's secretary on the occasion of the Dominion's Royal Commission visit to Newfoundland in 1914. He was honorary secretary of the Newfoundland Patriotic Fund, the Newfoundland Regiment Finance Committee and the Newfoundland War Penssons

Board after 1914; and chairman of the High-Cost-of-Living Commission after 1917. Author of 'From Ocean to Ocean' (1911); 'Newfoundland in 1911'

McGREADY, ma-grā'dĭ, James, American Presbyterian clergyman b. in Pennsylvania about 1760; d 1817 He studied for the ministry in the school of John McMillan, of Cannonsburg, Pa., and in 1788 was licensed to preach After some years of work in North Carolina, in 1796 he removed to southwestern Kentucky, and under his direction began the great revival of religion which culminated in 1800 and became memorable in the religious history of the country. He organized and conducted the first camp-meeting, and employed as preachers unordained young men without special theological training, thereby provoking dissension in the Presbyterian Church Out of this disagreement arose the Cumberland Presbyterian Church (see Presbyterian Church Out of this disagreement arose the Cumberland Presbyterian Church (see Presbyterian Church Out of this disagreement arose the Cumberland Presbyterian Church and resumed his fellowship in it. Two volumes of his sermons were published years after his death, the first at Louisville, Ky, in 1831, the second at Nashville, Tenn, in 1833 Consult Davidson, 'History of the Presbyterian Church in the State of Kentucky' (New York 1847); Edson, 'Early Presbyterianism in Indiana' (1898); Foote, 'Sketches of North Carolina, Historical and Biographical' (New York 1850; 2d series, 1855); Smith, 'History of the Cumberland Presbyterian Church'

MacGREGOR, mäk-greger, John ("Rob Roy"), Scottish traveler, writer and philanthropist: b Gravesend, 24 Jan. 1825; d Boscombe, 16 July 1892. He studied at Trinity College, Dublin, and was graduated from Trinity College, Cambridge, in 1847. He was called to the bar in 1851, but after a brief period in which he devoted himself to the law of patents he abandoned the profession and spent his time in travel and in works of philanthropy. He traveled in Europe, Egypt, Palestine, Russia, Algeria and America. He was deeply interested in the history and theory of marine propulsion and was largely instrumental in the introduction of canoeing into British sports. He constructed a canoe which he christened Rob Roy, and in which he made extended journeys. His books giving accounts of these expeditions were widely and deservedly popular. He was possessed of ample resources and gave liberally to philanthropic purposes. He sketched cleverly and illustrated his own books, and in early days occasionally contributed sketches to Punch. Besides numerous magazine articles he was author of 'Three Days in the East' (1850); 'Our Brothers and Cousins, A Tour in Canada' (1859); 'A Thousand Miles in the Rob Roy Canoe' (1866); 'The Rob Roy on the Baltic' (1867); 'The Rob Roy on the Jordan, Red Sea and Gennesareth' (1869), etc.

McGUFFEY, mak-guf'fē, William Holmes, American educator: b Washington County, Pa., 23 Sept 1800; d. Charlottesville, Va., 4 May 1873. He was graduated at Washington College, Pa., in 1826, was appointed professor of ancient languages at Miami University in that year, and in 1832 became professor of moral philosophy there. He was appointed president of Cincinnati College in 1836 and of

Ohio University in 1839 He was professor of moral philosophy at Woodward College, Cincinnati, in 1843-45, and thereafter until his death he was professor of moral philosophy and political economy at the University of Virginia He prepared the series of school reading- and spelling-books known under his name and for many years widely popular in the schools of the United States

McGUIRE, mă-gwīr', Hunter Holmes, American surgeon: b. Winchester, Pa, 11 Oct. 1835; d near Richmond, Va., 19 Sept 1900 He was graduated from the Winchester Medical College in 1855, and from the Medical College of Virginia in 1858, studying also in the medical schools of New Orleans and Philadelphia He was professor of anatomy at the Winchester Medical College in 1856-58 and afterward practised in Philadelphia He enlisted in the Confederate army at the outbreak of the Civil War, became medical director of the Army of the Shenandoah Valley and later of the Second Army Corps. He was in attendance upon General "Stonewall" Jackson at the time of his death in 1863 In 1865-78 he was professor of surgery at the Virginia Medical College, Richmond He organized Saint Luke's Home for the Sick in Richmond, with a training school for nurses. He was president of the American Medical Association in 1893.

MACH, mah, Ernst, Austrian physicist and philosopher b Turas, Moravia, Austria, 18 Feb. 1838; d. 9 Feb. 1916 After a partly private secondary education he studied at the University of Vienna, taking his doctor's degree in physics in 1860. After spending several years as privatdocent he was appointed professor of mathematics at Gratz and in 1867 was called to the chair of physics at the University of Prague. Here he published in 1883 his first important work, 'Die Mechanik in ihrer Entwickelung historisch-kritisch dargestellt, which has iun through seven German and several English edi-tions Having turned his attention to the re-lation of physiological and physical processes, he next produced his equally epoch-making 'Analyse der Empfindungen' (1886; 6th ed., 1911). Owing to his increased interest in epistemological and historical problems, Mach gladly accepted in 1895 the offer of a philosophical chair at Vienna, where he read on the history and theory of the inductive sciences. The following year appeared his 'Principien der Warmelehre,' while his university lectures ultimately took the shape of a substantial volume in 1905 under the caption 'Erkenntnis und Irrtum.' A paralytic stroke suffered in 1898 reduced the remainder of his life to a cripple's martyrdom, though it did not interfere with his mental activity. In spite of his liberal posi-tion in politics he was honored with the title of a court chancellor and was made a member of the upper chamber of the Austrian Parliament.

Mach's aim was to liberate science from metaphysical conceptions and thus he became in a sense a precuisor of pragmatism. His general trend of thought exerted a profound influence on men like William James, Jacques Loeb, Karl Pearson and Wilhelm Ostwald, and his attempt to substitute the mathematical notion of function in place of the time-honored concept of causality has recently found an ad-

vocate in Bertrand Russell. His definition of science as an economical description rather than an explanation of the universe aroused considable discussion in philosophical circles Sympathetic insight, impartiality, a singularly sane judgment and an almost complete freedom from preconceptions render Mach an ideal historian of science and one of the trustworthiest leaders of advanced thought. His principal works are accessible in English translations For a brief exposition of his philosophy with biographical notes consult Carus, Paul, 'Professor Mach and his Work' (in *The Monist*, January 1911, pp. 18–42).

ROBERT H LOWIE,
Professor of Anthropology, Univ. of California

MACHA, ma'ka, Charles Ignace, Czech poet b Prague, 10 Nov 1810; d. Leitmeritz, 5 Oct. 1836 His style of poetry is full of sentiment and reflection, a forerunner of the present Czech school of poetry, strongly influenced by Byronic "Weltschmerz," ie, the spirit bred by the realization of disharmony between ideals and concrete facts of reality. He studied in Vienna and Prague Extreme poverty caused pulmonary trouble, from which he died after a lingering illness His chief work, 'Maj' (Prague 1836), is a lyrical epic. His historic tales, such as 'The Gypsies,' etc, are in the style of Walter Scott His collected works were published in Prague (1862)

MACHÆRODUS, mā-kē'rō-dus, a genus of huge extinct cats, fossil in the Miocene and subsequent formations, and including the largest of the Nimravidæ. See Sabre-toothed Tiger

MACHÆRODONTINÆ, ma-kē'rō-dŏnti'ni, an extinct subfamily of Felidæ, including the sabre-toothed cats and their allies. This group became separated from the typical cats (Felinæ) in the Oligocene epoch, and remained a numerous and powerful element of the carnivora of the world until the close of the Pleistocene. The general form and structure were catlike, and produced an equally effective armament, except, perhaps, in speed, for the limbs were shorter and heavier as a jule than in the feline cats of similar size, and the hind foot had five toes, instead of four Another difference was in the comparative shortness of the tail. Mainly, however, the specialization of this subfamily was in the dentition, which dif-fered from that of the cats in many particulars, and especially in the extraordinary development of the upper canines into huge stabbingtusks, especially striking in Smilodon, one of the most modern and widely distributed American genera Other genera are Hoplophoneus, a primitive genus of the White River beds, with species of small size; Macharodus, Eusmilus and Dinictis were other White River genera of importance, while later forms illustrate the genera Archælurus and Nimravus

MACHAR, ma-kär', Agnes Maule (FIDELIS), Canaddian author b Kingston, Ontario, about 1856 She was educated at Kingston and at an early age her contributions began appearing in the magazines of Canada, England and the United States She was author of a volume of verse, 'Lays of the True North'; two historical works, 'Memorials of Rev. Dr Machar'—the author's father; 'The Story of Old Kingston' (1908); 'Stories of the British Em-

pire' (1913); and the novels, 'Katie Johnston's Cross'; 'Lost and Won'; 'Roland Graeme, Knight' (1892); 'The Heir of Fairmount Grange,' etc D. 24 Jan. 1927.

McHENRY, māk-hēn'rī, James, American mılitary surgeon and politician: b. Ballymena, County Antrim, Ireland, 1753; d. 1816 He had studied at Dublin, when, about 1771, he came to America, and in Philadelphia soon entered upon the study of medicine under Dr Benjamin Rush (qv) On the outbreak of the Revoluton he became surgeon of the 5th Pennsylvania battalion; in November 1776 was taken prisoner at Fort Washington; was paroled in the following January, and in March 1778 exchanged In May of that year he was made assistant private secretary to Washington, and held that position until October 1780, when as major he was appointed to a place on the staff of Lafayette Elected in 1781 to the Maryland senate, he continued a member of that body until 1786 being also during the second half of that period a delegate to the Confederation Congress In 1787 he was made a member of the Constitutional Convention, in 1789 was elected to the general assembly of Maryland, and sat in the senate of that State, 1791-96, when he was appointed by Washington Secretary of War, retaining that position in the cabinet under John Adams' administration until 1800 As an ardent Federalist he used his influence in favor of a strong national defense, and was a zealous partisan of Alexander Hamilton His partisan-ship in favor of Hamilton led to a request for his resignation from President Adams. After resigning from Adams' Cabinet he spent the rest of his life in Maryland. Fort McHenry (qv) was named after him.

McHENRY, James, American physician and author: b Larne, County Antrim, Ireland, 20 Dec. 1785; d there, 21 July 1845. He was educated in Dublin and Glasgow, practised his profession for a time in Ireland and in 1817 emigrated to the United States and finally settled in Philadelphia, where he practised medicine and was engaged in mercantile business In 1842 he was appointed United States consul at Londonderry and held that post until his death. Among his works are 'The Usurper; an Historical Tragedy' (played in Philadelphia 1820); 'The Wilderness, or Braddock's Times: A Tale of the West' (2 vols, 1823); 'Jackson's Wreath' (1829); 'O'Halloran, or the Insurgent' (1824); 'The Betrothed of Wyoming' (2d'ed., 1830), etc.

McHENRY, Fort. See FORT MCHENRY.

MACHETE, ma-chā'tā, a short sword-like tool, half knife, half cleaver, used in Cuba and other countries of tropical America for cutting cane and as a weapon in war. It was first brought into prominence during the Cuban revolution

MACHIAS, ma-chi'as, Me., town and Washington County seat; alt. 80 feet; on the Machias River, near the sea; 89m. E. of Bangor; on the Maine Central Railroad. There are truck and poultry farms near by, and grist mills and granite quarries; lumber and shipbuilding are also local industries. A "long lumber" log drive takes place on the river each spring. A state normal school is in Machias, and at East Machias are Washington Academy (1823) and

the summer surveying school of the Massachusetts Institute of Technology. A trading post was established here in 1633 by Englishmen, but they were soon driven out by the French. The first permanent English settlement was made in 1763. In the Revolutionary War Machias participated prominently in the harassing of the British along the coast; in 1775 Machias seamen captured the British armed schooner Margaretta and, in reprisal, the town was partly burned by forces from the ship Ranger. In 1863, in observance of the town's centennial, an anniversary memorial was published. Pop. (1940) 1,954.

MACHIAVELLI, Niccolo, nē-kō-lō' mākē-a-vēl'lē or māk-ĭ-a-vel'li, Italian historian and statesman, possibly the greatest prose writer of the Italian Renaissance b Florence, 3 May 1469; d. there, 22 June 1527. Of Nuccolo's early life and education we know nothing. No trace of him remains previous to his 26th year. But of his times and the scenes amid which he grew up, we know much. It was the calm but demoralizing era of Lorenzo the Magnificent Machiavelli was a true child of his time. He too was thoroughly imbued with the spirit of the Renaissance; and looked back, fascinated, on the ideals of that ancient world that was being revivified for the men of his day. But philosophy, letters and art were not the only heritage that the by-gone age had handed down; politics—the building of states and of empires—this also had engaged the minds of the men of that age, and it was this aspect of their activity that fired the imagination of the young Florentine. From his writings we know he was widely read in the Latin and Italian classics. But Virgil and Hor-ace appealed to him less than Livy, and Dante the poet was less to him than Dante the politician; for he read his classics, not as others, to drink in their music or be led captive by their beauty, but to derive lessons in statecraft and penetrate into the secrets of the successful empire-builders of the past. It is equally certain, from a study of his works, that he had not mastered Greek Like Ariosto, Machiavelli was indebted for his superb literary technique solely to the study of the literature of his own nation.

With the expulsion of the Medici from Florence, Machiavelli, at 30, emerged from obscurity to play a most important rôle in the Florentine politics of the succeeding decade and a half. In 1498 he was elected secretary to the Ten of War and Peace and from 1498 to 1512 was a zealous, patriotic and indefatigable servant of the republic. His energy was untiring, his activity ceaseless and many-sided. He conducted the voluminous diplomatic correspondence devolving upon his bureau, drew up memorials and plans in affairs of state for the use and guidance of the Ten, undertook the reorganization of the Florentine troops and went himself on a succession of embassies, ranging in importance from those to petty Italian states up to those to the court of France and of the emperor. He was by nature well adapted to the peculiar needs of the diplomacy of that day; and the training he received in that school must in turn have reacted on him to confirm his native bent and accentuate it until it became the distinguishing characteristic of the man. His first lessons in politics and statecraft were derived from Livy's history of the not overscrupulous Romans; and when he comes to take his lessons at first hand, it is in the midst of the intrigues of republican Florence, or at the court of a Caterina Storza, or in the camp of a Cesare Borgia Small wonder that his conception of politics should have omitted to take account of honesty and the moral law; and that he conceived "the idea of giving to politics an assured and scientific basis, treating them as having a proper and distinct value of their own, entirely apart from their moral value."

During this period of his political activity we have a large number of state papers and private letters from his pen; and two works of literary cast. These are his 'Decennale'; historic narratives, cast into poetic form, of Italian events. The first treats of the decade beginning 1494; and the second, an unfinished fragment, of the decade beginning 1504. They are written in easy to zine, and are noteworthy as expressing the sentiment for a united Italy.

When in 1512 the Medici returned to Florence in the train of her invader, Machiavelli was dismissed from his office and banished for a year from the confines of the city. Later, on suspicion of being concerned in a plot against the Medici, he was thrown into prison and tor-tured. He was afterward included in a general pardon granted by Leo X But Machiavelli did not return to public life until 1525; and this interval of enforced leisure from affairs of state was the period of his literary activity. A number of comedies, minor poems and short prose compositions did not rise above mediocrity. But in one dramatic effort he rose to the stature of genus. His 'Mandragola' achieved a flattering success, both at Rome and in Florence has been pronounced the finest comedy of the Italian stage; Macaulay rated it as inferior only to the greatest of Molière's. In its form, its spontaneity, vivacity and wit, it is not surpassed by Shakespeare; but it is a biting satire on religion and morality, with not even a hint of a moral to redeem it.

His lesser prose works are the 'Life of Castruccio Castracani,' and the 'Art of War,' a treatuse anticipating much of our modern tactics. A more ambitious undertaking, and his largest work, is the 'History of Florence.' At the suggestion of the Cardinal de Medici, the directors of the studio of Florence commissioned Machiavelli to employ himself in writing a history of Florence, "from whatever period he might think fit to select, and either in the Latin or the Tuscan tongue, according to his taste." He was to receive 100 florins a year for two years to enable him to pursue the work. He chose his native tongue; and revised and polished his work until it became a model of style, and in its best passages justifies his claim to the title of the best and most finished of Italian prose writers.

But though Machiavelli had the historical style, he lacked historical perspective; he arranged his matter not according to objective value, but placed in the boldest relief those events that best lent support to his own theories of politics and statecraft. He makes his facts to be as he wishes them, rather than as he knows them to be. To Machiavelli history was largely to be written as a *Tendenzyoman*,—manufactured to point a preconceived moral,

Though Machiavelli wrote history, poetry and comedy, it is not by these he is remembered The works that have made his name a synonym, and given it a place in every tongue, were written almost in the first year of his retirement from political life. 'The Prince' and the 'Discourses on the First Ten Books of Titus Livius.' Each is a treatise on statecraft; together they form a complete and unified treatise, and represent an attempt to formulate inductively a science of politics. The 'Discourses' study republican institutions, 'The Prince' study republican institutions, 'The Prince' monarchical ones. The first is the more elementary and would come first in logical arrangement But in the writing of them Machiavelli had in view more than the foundation of a science of politics He was anxious to win the favor of the Medici; and as these were not so much interested in how republics are best built up, he completed 'The Prince' first, and sent it forth dedicated "to the magnificent Lorenzo, son of Piero de' Medici. In the 'Discourses,' the author essays "a new science of statesmanship, based on the experience of human events and history. In that day of worship of the ancient world, Machiavelli endeavors to draw men to a study of its politics as well as its art. In Livy he finds the field for this study.

In his commentary on the course of Romulus in the founding of Rome, we find the keynote of Machiavelli's system of political science His one aim is the building of a state; his one thought, how best to accomplish his aim. Means are therefore to be selected, and to be judged, solely as regards their effectiveness to the business in hand Ordinary means are of course to be preferred but extraordinary must be used

when needed In 'The Prince,' a short treatise of 26 chapters, and making little more than a hundred octavo pages, Machiavelli gives more succinct and emphatic expression to the principles of his new political science. It is the best known of all his works. It is the one always connected with his name, and which has made his name famous For the model of his prince, Machiavelli took Cesare Borgia and cites him as an example worthy of imitation; and he has shared in the execration that posterity has heaped upon Borgia. The strangest moral contradictions abound throughout 'The Prince,' as they do in all Machiavelli's writings. He is saint or devil according as you select your extracts from his writings.

Shakespeare, reflecting English thought, uses his name as the superlative for craft and murderous treachery. But later years have raised up defenders for him, and his rehabilitation is still going on. He has been lauded as "the noblest and purest of patriots," and more ardent admirers could "even praise his generosity, nobility, and exquisite delicacy of mind, and go so far as to declare him an incomparable model of

public and private virtue»

His rehabilitation proceeds from two causes. Later research has shown that perhaps he only reflected his time; and his works breathe a passionate longing for that Italian unity which in our day has been realized. He may be worthy canonization as a national saint; but those who are more interested in the integrity of moral standards than in Italian unity will doubtless continue to refuse beatification to one who in-

deed knew the Roman virtus, but was insensible to the nature of virtue as understood by the followers of Christ And no amount of research into the history of his age can make his principles less vicious in themselves A better understanding of his day can only lessen the boldness of the relief in which he has heretofore stood out in history He was probably no worse than many of his fellows He only gave a scientific formulation to their practices. He dared openly to avow and justify the principles that their actions implied They paid to virtue the court of hypocrisy, and like the Pharisee of the earlier time, preached righteousness and did evil; but Machiavelli was more daring, and when he served the devil, disdained to go about his business in the livery of heaven PRINCE, THE). Among the editions of the collective works of Machiavelli may be mentioned those of Milan, 1810-11; Florence, 1813, Milan, 1821-22; Florence, 1826, 1843; and Florence (6 vols, 1873-77); Boston English translation (1891). The rendering of the 'Art of War' and 'The Prince' (in the 'Tudor Translations' Vols XXXIX and XL, London 1905), with Cust's introduction, is an admirable piece of work Consult Dyer, 'Machiavelli and the work Consult Dyer, 'Machiavelli and the Modern State' (Boston 1904); Morley, John, 'Machiavelli' (London 1898); Mourrisson, 'Machiavelli' (Paris 1883); Tommasini, 'La vita e gli scritti di Niccolo Machiavelli' (Turin 1882); Villari, 'Niccolò Machiavelli' (Turin 1882); Villari, 'Niccolò Machiavelli' e i suoi tempi' (Florence 1877-82), and Burd's study (in the 'Cambridge Modern History' Vol. I, Cambridge 1902), with bibliography. Cambridge 1902), with bibliography

MACHINE COMPOSITION. See COM-POSING MACHINES.

MACHINE DESIGN. See Drawing MECHANICAL AND MACHINE DESIGN.

MACHINE ENGRAVING, a mechanical process for engraving on wood, metal or stone. Since 1880 numerous machines have been invented to produce regular tints, geometrical and other designs and patterns, far more rapidly than by hand work. The most complex engraving is now executed wholly by machinery. Engraving by mechanical means is now generally employed in the making of banknotes, diplomas, stock certificates and other papers and documents, where special designs are required. Elaborate gearing systems have been introduced whereby the cutting tools execute a certain number of symmetrical motions and thus produce elaborate geometrical patterns The first engraving machine was the invention of Wilson Lowry and was employed to engrave the plain background, skies, etc., of a plate. Most modern machines are so fitted that the cutting tool may be moved a certain definite distance after each cut so that the succeeding cut will be a line parallel to and at a regular distance from the last. The cutting tool is also fitted so that the depth and breadth of the cut may be easily regulated. The cutting edge is usually of highly-tempered steel for metal work, except in the case of copper, which is often coated with varnish, next scratched with the design and afterward etched by acid. For stone work, the cutting tool has a diamond-point and weights on the holder regulate the depth of the cut to be

MACHINE FORGING. The art of the blacksmith, working by hand at the forge and anvil, has almost wholly disappeared, and the shaping of wrought iron and steel is now performed by machines The exact duplication of parts of machinery began in the United States about 1854, and it became necessary to have forgings of uniform size so that they could be properly handled in special fixtures or holders while being machined to exact dimensions

Drop Forging.—In the first attempt to obtain uniform forgings the smith hammered by hand the rough stock into a rude suggestion of the shape wanted so as to properly distribute the material and then placed it in an impression cut in a block of steel or cast to shape and forced it into the cavity by a series of blows from hand hammer and sledge

The growing demand for firearms and other accurately made mechanisms developed the necessity for improvements in this line which kept pace with the requirements of the times, until the drop-hammer was produced These hammers are named invariably by the weight of the hammer-head or ram and they range in sizes from 50 to 5,000 pounds.

Hammers are also constructed to operate by steam power of heavier types. They lift the ram or hammer head and drive it downward by steam power in a manner similar to the regulation steam-hammer. The regular belt-driven drop-hammer, as used in drop-forging, is operated usually by a treadle which the workman trips with his foot. This movement releases a clamp or catch which holds up the hammerhead and allows it to fall or drop It is raised by the friction of two rolls which revolve rapidly, gripping the surface of a board which is wedged into a slot in the top of the hammer-head or ram The hammer-head is clamped or latched at the end of the upstroke by an automatic attachment and released at the will of the operator.

The hammer-head or ram is made usually with a dovetail opening at its bottom, into which is placed the upper die It is held firmly in position by a key driven into place by sledg-The base or anvil of the drop-hammer is made of cast iron or cast steel, and a forged steel seat or holder for the lower die is keyed into the base in a similar manner. This seat or holder is frequently called a "sow" or "shoe," and is adapted merely to save useless wear of the base. It can be renewed at a small cost. similar dovetail opening is made in this holder into which the lower die is placed This is keyed into exact position to match the upper die so that when the faces of the dies meet at the end of the down stroke the complete impression is formed.

Drop-hammers are made generally of cast iron, i.e., the base or anvil, the side rails or guides and the lifter frame. The working parts are made from forged steel. Various heights of the fall or drop of the hammer-head can be had by shifting a "latch" or "dog" on the coenting rod. From six inches to five fort. the operating rod. From six inches to five feet fall can be obtained if desired. Foundations are best made of solid concrete In connection with the drop-hammer a press is used to remove by a trimming operation the "flash" or surplus metal which spreads out between the dies after the impression therein is filled. This "flash" is sheared off either hot or cold as the character of the work permits.

Making the Dies .- A model of the part to be forged is made, usually of wood, if it he a form not clearly shown by a drawing When given this model or a scale drawing and the required weight of the finished forging, the die-sinker has the principal data required by him to make the dies. After selecting the After selecting the proper size blocks which have been planed smooth and made with dovetails or shanks, the die-sinker determines from his model the best parting line for the forging in much the same way as does the pattern-maker on a pattern for a casting, but the analogy between the two is comparatively slight as the conditions are radically different

The pattern-maker can use cores and loose pieces to make cavities and overhauging paits, but the die-sinker is practically limited to a die opening in two parts, which must be made to stand the roughest usage. The outline of the piece to be forged is drawn on the surface of the die which has been coppered with a blue vitriol solution, this causing the lines to stand out sharply. The metal is then removed in a manner that is most expedient for that particular example If the outline be circular the stock is turned out on a lathe. If the shape of the forging be such that other means are required for removing the metal from the die, the profiling machine readily furnishes a way for following the most complicated forms by means of milling cutters of various shapes and sizes. The shaper and milling machines are also impressed into service as well as the planer and drill.

Chipping by hand is commonly done, and in nearly every case a file, riffle, scraper and some emery cloth are required to finish the impression to the required smoothness and regularity.

The forming of an irregular cavity in the face of a high carbon steel die so that when its mating die is matched to it the shape of the space enclosed will not vary from the specified dimensions more than 2-1,000ths of an incheither way is an operation requiring skill and patience.

After the complete impression is made a proof can be taken by filling the cavity with melted lead A shallow space is cut in the face of each around the impression. This is technically called the flash of the die. As it is practically impossible for the drop-forger to form the bar or billet of steel into just the shape and size required for the forging, this space must be left for the overflow of surplus metal.

If the article to be forged is of a simple form only one pair of forging dies is necessary as the "roughing" or "breakdown" impressions can be cut in the same pair of blocks which contains the finishing impressions. If the piece be more complicated, separate "roughing" or

"breakdown" dies are necessary.

Trimming dies, to be used in the press, are necessary to remove the flash. They are made in male and female form; the upper part being the male die and the lower one the female. The male die is made of the outline of the forging through the parting line, and with its face conforming to all the irregularities of the upper part of the forging. The female die is open at the bottom so that the trimmed forging can fall through it into a receptacle under the press. is also made with its cutting edge conforming to the parting line.

The dies are then heated carefully in furnaces, the heat of which is usually determined by a pyrometer to ensure uniformity of temperature, and are then hardened and tempered Any warping in hardening which may occur is remedied by grinding the surfaces with an emery wheel. See Dies and Die Making

The operation of drop-forging consists of first heating the bar or piece to a proper temperature. The heat depends entirely on the quality of the metal used. It is then placed in the "roughing" or "breakdown" impression and given a number of blows which shape it roughly into form and it is finally placed in the finishing impression and forged to the exact shape. The flash is then trimmed off in the press and the forging is practically complete.

The number of blows required depends entirely on the shape and size of the forging Some pieces can be made by two or three blows while others may require as many as 100.

If the forgings are made of high carbon steel it is frequently necessary to anneal them so that they can be readily machined, and in many cases pickling in a weak solution of sulphuric acid is resorted to, so as to remove the scale or oxidation which forms on the surface of each forging while cooling.

Drop-forgings can be made from iron, steel, copper, bronze or aluminum, or from any metal which will not disintegrate during heating or while being worked. For instance, brass cannot be forged successfully. They can vary in weight—from a fractional part of an ounce

to over 100 pounds each

Upsetting and Forging Machines.- Toward the close of the 19th century it became recognized that forging could be accomplished by pressure as well as by blows, and this idea was developed into the commercial upsetting and forging machines which now handle the bulk of small parts and a good many large parts of modern machines Hammer-blows cause jar and vibration which are destructive to the machine itself, and require heavy foundations, heavy bed-plates, etc. The pressure machines do their work with less noise and more scientifically. The very much reduced cost of building automobiles and a great variety of duplicate machines that are turned out in large numbers is due largely to the quick shaping made possible by machine forging. An upsetting and forging machine is made with a very heavy steel bed The opposed dies for gripping the work are gripped in the machine, and the pressure is applied by a toggle-joint mechanism. In all such machines it is necessary to limit the pressure, else excess would break the machine. This limitation is accomplished in two ways—by placing heavy springs in the machine which give when a certain pressure is attained; and by locking the back of one of the die supports with a bolt of a given strength, arranged between hard square edges which will cut or shear off the bolt when the pressure reaches above a given point.

The method of making a common hexagonal nut in such a forging machine consists in (1) placing the dies in the forging machine; (2) heating a bar of iron between 1,400° and 1,600° F.—the temperature varying with the character of the iron; (3) thrusting the red-hot end of the bar into the lower die in the forging

machine, and throwing the lever to cause the machine to squeeze, which upsets the end of the bar and shapes it for a nut; (4) withdrawing the bar quickly and placing in the upper die; (5) repeating the squeeze, which forces the hole through the nut, leaving the removed metal on the bar, and separating the nut. The nut is delivered with a slight fin, which has to be removed, when it is ready to go to the thread-cutter.

The front axle of an automobile may be forged in one of these pressure forging machines in about seven operations. The last squeezing operation delivers the completely formed axle. Any quantity of more or less intricately formed parts are now made of wrought iron and steel in this manner, the heavier operations being done on the steam-hammer, as

a rule.

The forging machine is also used for welding or joining separate pieces by pressure. It is just as easy to apply a flux to assist the joining in the forging machine as on the anvil. The Ajax universal forging machine not only compresses the dies, but has an independent vertical press that can be used for any operation within its capacity; also a punching device and a trimmer

A variety of special forging machines are made for forming common articles, or parts required in large quantity. Many of them are named after the work they accomplish. The hot-pressed centre-feed nut machine is simply a small forging machine designed for making nuts. Bolt-heading machines and bolt and rivet headers are other examples of special forging machines.

Pressed steel is made by great hydraulic presses at the steel works. Preces requiring but slight shaping are pressed in the cold; more or less complicated forms are heated to a cherry red and then light-pressed. Modern railway steel cars are made in this manner. Armor plates are formed in hydraulic presses under immense pressures which are maintained for a considerable time.

CHARLES H. COCHRANE

MACHINE GUN. An automatically reloading weapon of small calibre which discharges several bullets per second when pressure is maintained on the trigger; the weapon most destructive of life in modern warfare. There are four general classes of machine guns as to size submachine guns, and light, heavy, and special machine guns. They may also be classified as gas-operated and recoil-operated, depend-ing upon whether the automatic reloading is accomplished through the action of a part of the escaping gases of each exploding cartridge, or through the action of recoiling parts. Other classifications are based on belt-feeding and magazine-feeding, and air-cooling and water-cooling. Belt-fed guns use cartridges held in the loops of a narrow belt, usually of cloth, which contains several hundred rounds and moves rapidly through the feeding and firing mechanism during firing, until the belt is exhausted and the first cartridge of a new belt must be engaged into the mechanism by hand. Magazine-fed guns use metal cartridge containers (magazines) which are inserted full of cartridges in a receptacle of the gun and remain there till emptied, when, for further firing, the

empty magazine must be removed and a full one inserted. Both belts and magazines can be reloaded and used repeatedly.

Air-cooled guns have projecting, and usually circular, metal fins along the outside of the gun barrel to radiate away the heat generated by firing, and make use of the movement of air over these fins to cool the gun. Water-cooled machine guns have a cylindrical water jacket or tank around the barrel for the same purpose. Air-cooled guns as a rule become hot more readily than water-cooled. With either, it becomes necessary after a few minutes of continuous firing to cease firing and allow the gun to cool off. Otherwise the barrel becomes red hot and its metal softened, so that further firing destroys the accurate rifling within the barrel. Since it may be necessary in combat thus to spoil a barrel, spare barrels are carried for most types of heavy and special machine guns

Submachine Gun.—This is a magazine-fed weapon of about the weight of a shoulder rifle. It is usually held in both hands and fired from the waist, but can also be fired from the shoulder. The best known type is the Thompson, which uses calibre 45 pistol ammunition in magazines holding 20 or 50 rounds. It is a powerful weapon for fighting at close range, and is used by police and criminals as well as by armies. This weapon is standard equipment in the cavalry of the United States Army, where it is used as a close-in-defense weapon for armored scout cars and combat cars (tanks) and

as a weapon for motorcyclists. It is also used in the United States Marine Corps. Light Machine Guns.—The term «light» simply means that the gun and its mount, usually weighing under 25 pounds, and a few hundred rounds of ammunition can readily be carried in combat by a single soldier, though others must carry enough additional ammunition for the sustained firing of battle. All light machine guns are air-cooled and most of them magazinefed. This class strictly includes also the «automatic rifle," a fast-firing shoulder weapon without a mount. The automatic fire of this weapon, however, cannot be held to accurate aim. Consequently, in the United States Army, a folding bipod mount attached near the muzzle and a small, adjustable, single-stand mount attached to the stock have been used to convert the standard Browning automatic rifle, an aircooled, gas-operated weapon, into a light machine gun. This weapon is still fired from the shoulder like a rifle by the soldier in a prone position, but the additional points of contact with the ground have much increased its accu-

Light machine guns, because of possible overheating, are not capable of the high rate and sustained periods of fire of heavy machine guns. The actual rate of automatic fire of most light machine guns is from 250 to 500 rounds per minute. But to avoid overheating and waste of ammunition, they are fired in bursts of four or five rounds, with intervals of several seconds between bursts to observe the effect of the firing and regain accurate aim. Also, time is consumed in exchanging empty magazines for loaded. Hence the maximum practicable rate of fire is seldom over 100 rounds per minute. Most light machine guns can also be limited to single-shot

fire by a simple lever adjustment.

In most armies of the world, both light and heavy types of machine guns are of the same calibre as the standard infantry rifle, and thus use the same ammunition. In the United States Aimy, all machine guns except certain special types are calibre .30.

Light machine guns are used mainly for direct fire against hostile targets visible to the gumner. The method of operation is similar to that of the heavy machine gun in direct fire described below. For tactics of light machine-

gun units see Infantry.

Heavy Machine Guns.—The weight of a heavy machine gun and its mount and accessories requires its transportation by some other means than carrying by hand, except for short distances in actual battle. Hand-drawn or animal-drawn carts, pack animals, and small motor-truck carriers are all used. The United States Army, between 1930 and 1910, changed from animal to motor transport for heavy machine guns, in all but a few units. European armies, by 1940, were still using animal transport in the main. Tanks and armored cars, and fighting types of airplanes, also are essentially machine-gun carriers of special types. When heavy machine guns must be carried by hand, one member of the gun squad carries the gun, and eight or ten others carry the tripod mount the extra water containers (for water-cooled guns), the spare barrels and other accessories, and the boxes of ammunition belts or magazines, so that each carries from 25 to 40 pounds.

Heavy machine guns may be either air- or water-cooled and almost all types are recoiloperated. The automatic fire rate of heavy machine guns is from 450 to 600 rounds per minute for those used in ground combat. These are also fired in short bursts, so that the maximum practicable rate of fire is about 250 rounds

per minute for ground combat.

Operation of Heavy Machine Guns .-- In combat on the ground heavy machine guns are usually fired from a low, sturdy tripod mount to which the gun is firmly clamped. A fixed mount of some kind is necessary. The gunner sits or lies behind the gun to aim and fire it. The tripod has an elevating and depressing mechanism operated by a handwheel for moving the gun up or down, and may also have a traversing mechanism, similarly operated, for moving the gun laterally. Some types require traversing to be done by heavy blows of the hand against the tightly clamped gun to turn the gun and its pintle in the socket of the mount. Most heavy machine guns permit a 360° traverse without moving the tripod, although the gunner can only traverse about 120° without moving around to a new position.

Before firing, the gunner adjusts his aim through sights similar to those of a military rifle. The point of aim may be an actual hostile target, such as troops, in «direct» machinegun fire; or an established aiming point, such as a mark on a stake, in «indirect» fire conducted at hostile targets not visible to the gunner. Since vibration and smoke make it impossible to look through the sights during firing, the gunner, in direct fire, observes the effect of his fire over the top of the gun and sights, usually by watching the dust or earth raised where the bullets strike the ground. In indirect fire the gunner cannot observe. In both kinds of firing, the gunner pauses briefly after every few bursts to

check his aim through the sights because vibration may settle the mount in the ground. To obviate such settling, bases of wood or concrete, with sandbags or clamps to hold the legs of the tripod solidly in place, are used in machine-gun emplacements of permanent or semipermanent

defensive positions.

The fire of heavy machine guns may be directed at a «point» target such as an enemy machine gun or a small group of men, but is mainly used to cover areas of some width and depth Owing to the vibration of the gun, the discharged bullets do not follow accurately in the same path of trajectory. At a range of half a mile, for example, the bullets strike level ground within a beaten zone which is about 150 feet long and 10 feet wide. Consequently, if a burst or two is fired at one setting of the gun in elevation, and the gun is then alternately fired and traversed through a slight angle in one direction (continually to right or left) a series of adjacent beaten zones of any desired total width up to several hundred feet can be covered by fire As an example, an area 300 by 300 feet may be assigned to a single gun. By alternately traversing and firing from one side of this area to the other, the gunner covers the full width of the area and about one-half (the nearest half) of its depth, except for the ground sheltered behind rises and depressions which the flat trajectory of the gun cannot reach. The gunner then increases the range by elevating the gun enough for the fire to strike the farthest half of the square area, and alternately fires and traverses in the opposite direction, and thus covers the whole area with fire. By alternately firing bursts and traversing (or elevating or depressing) the gun, the gunner can cover an area of any shape with fire.

For direct fire, heavy machine guns are usually placed in pairs to insure continuous fire in combat because the firing mechanism occasionally jams. Gun squads are thoroughly trained to remedy most stoppages in a few seconds. The two guns of a pair are fired from positions far enough apart to prevent the destruction of both by a single enemy shell but close enough for fire direction under one leader. The two guns of a pair may cover the same area or point target with their fire. But for targets wider than approximately the angle subtended by 100 feet at 1,000 feet, each gunner usually fires on half of the target width. For direct fire on extremely wide targets, four guns may be fired under the direction of a single leader. Guns are used singly only when an extended front must be covered by few guns. Direct machine-gun fire is considered effective at targets up to ranges of about a mile. Beyond that range the effect of the fire cannot be observed,

even with field glasses.

Indirect fire, on areas out of sight of the gunners, is effective up to about two miles with accurate, modern, heavy machine guns. For this fire, the guns are usually employed in batteries of four under the direction of one officer. The data from which are found the elevation and directions for pointing the guns to hit the unseen target, are calculated in two ways. Ranges and angles-of-direction may simply be measured on an accurate map or airplane photograph containing the positions of the target and the guns. Or ranges and directions may be measured directly on the ground from some high point from which

the guns and the target can both be seen. For the latter method, an optical instrument called a range-finder is used to measure ranges, a magnetic optical instrument such as an aiming-circle, is used to measure vertical angles from the north and horizontal angles. The horizontal angles and ranges from the observation point to the target and to the guns are plotted on a drawing board. A line is drawn from guns to target, the range measured with a scale, and the direction-angle with a protractor. This procedure amounts to a simple survey, and may be expanded to include one or more intermediate observation points between the guns and the point from which the target is visible.

The rapidity of such surveys depends largely upon the accessibility of the observation points. If most of the distance can be traveled in a motor vehicle, a survey from a single observation point can be completed in a few minutes, and the result either signalled or taken back to the guns. To determine the correct angle-of-elevation for the guns to hit the targets requires a simple calculation to allow for the difference in elevation of guns and target, and then a reference to a brief set of firing tables in which range is converted into angular measurement. The guns are then turned and raised to the correct angle. Firing may begin then, or at any time later when the enemy is known or suspected to be occupying the area at which the guns are directed. Surveys are often made, and data calculated and recorded in advance, for a number of possible future to rosets.

ber of possible future targets.

Organization and Tactics of Light and Heavy Machine-Gun Units.—In a broad sense there are no separate tactics for light or heavy machine guns. During the World War of 1914-18, heavy machine-gun units were organized in battalions of three or four companies each manning about 12 guns. The experience of battle proved, however, that three battalions could seldom be used in combat as units, and that even companies had to be split into their separate four-gun platoons for purposes of combat. The battlefield also proved that machinegun units have no tactical uses distinct from those of the infantry rifle units. And as a result, the tendency in all armies after 1918 was to include heavy machine-gun units in infantry battalions or regiments in the ratio of about one company (12 guns and some 200 men) to three rifle companies (some 600 men), and to include light machine-gun units within the rifle companies and smaller units. Except for the fact that some heavy machine guns were replaced by special antitank machine guns in 1938, this is now true in the United States Army as in other major armies. See Infantry.

The part of the machine gun in infantry tactics, both offensive and defensive, is that of a powerful supporting weapon. In an attack, light machine gunners keep close in rear of the leading riflemen and fire to the front through gaps between rifle units, and also across the front of adjacent rifle units which have been held up by hostile fire. Heavy machine guns, from positions farther back, usually on high ground, fire over the heads of the advancing rifle units or along their flanks, as long as it is safe to do so. When the rifle units (including light machinegun units) have advanced some distance against the enemy, say half a mile, heavy machine guns are rapidly loaded into light cross-country motor

carriers and moved forward to new positions from which they can again support the rifle troops. About half of the heavy machine guns supporting a given number of rifle units are thus moved forward at a time, and the other half are kept in the original firing positions until the others are firing from their new positions. The rear guns then move forward to new positions. This movement forward by bounds from one supporting position to another continues until the leading rifle troops teach and occupy the final objective.

In an attack, the fire of supporting light machine guns and often that of heavy machine guns, is almost always placed on hostile resisting elements, such as groups of riflemen and machine guiners, whose positions are either definitely known or suspected. Whenever possible, fire is delivered at enemy elements whose fire is liable to prevent the continued advance of the rifle units leading the attack. Only when the irregularities of the ground prevent direct fire do heavy machine-gun units employ indirect fire upon areas liable to contain enemy troops but not definitely known to. Thus, in offensive combat, the fire of light and heavy machine guins is never simply an aimless hall of lead striking the general areas that the enemy holds. If there are no known or suspected targets for machine gunners to fire upon, they save their ammunition for a more effective use later on.

If tanks are assisting the leading rifle units

in the attack, the work of light and heavy machine guns differs little from that already described. In defensive infantry combat machine guns are the most important weapon. See

INFANTRY.

Airplane and Tank Machine Guns.-The heavy machine guns used in the airplanes of an army are usually of the same types used by ground troops except for being air-cooled instead of water-cooled and for having special mounts. Modern fighting planes have as many as eight guns mounted under the wings to fire forward and operated by a single trigger from the cockpit. For air fighting these guns are given a high rate of fire, above 1,200 rounds per minute in some types For defense against at-tack by hostile planes, bombardment and other large types of planes have heavy machine guns mounted in cockpits for individual fire upward and downward and to the sides and rear.

Both air- and water-cooled machine guns are used in tanks and armored cars. See TANKS and ARMORED CARS.

Special Types of Machine Guns.—Special machine guns include such weapons as the calibre .50 antitank machine guns used by the infantry and cavalry of the United States Army, and calibre .50 antiaircraft machine guns used by the Coast Artillery Corps. Some fighting aircraft carry such machine guns and they are also mounted in tanks and armored cars. They may be either air- or water-cooled and are recoil-operated and usually belt-fed. They fire bullets several times the weight of those used in rifles and heavy machine guns. Antitank machine guns are mounted on low tripods and antiaircraft machine guns on high ones. Both weigh so much that they are carried by hand only for short distances and are largely transported on morors.

> CAPT. JOSEPH I. GREENE, Infantry; Associate Editor, The Infantry Journal.

MACHINERY-MANUFACTURING IN. DUSTRY IN AMERICA. Owing to the restrictive measures of Great Britain this industry made a late start in America, but when a beginning was made, the very laws by which the mother-country sought to make the States dependent on her proved more stimulating to the development of our machinery-manufacturing industry than the most rigid system of protective tariff would have been. Great Britain wished to confine manufactures to her shores and compel the American colonists to buy their manufactured articles from English factories. At first the colonists were not allowed either to manufacture or to import machinery. In the year 1774 a statute was enacted by Parliament instituting the restrictive system as to textile machinery. This statute was made more stim-gent in 1781, and it was not actually repealed till 1845. This act prohibited the exportation of «any machine, engine, tool, press, paper, utensil, or implement whatever, which now is, or may at any time be, used in or proper for the preparing, working, pressing, finishing, or completing of the linen, cotton, wool or silk manufactures of this kingdom, or any other goods wherein wool, silk, or cotton is used, or any part of such machine, etc, or any model or plan of any such machine," under penalty of forfeiture of the tools or machine, the payment of a fine of £200 and imprisonment for one year. Further, foreigners were prohibited, under a penalty of £500 and imprisonment for 12 months, "from seducing artificers, and others employed in the manufacartificers, and others employed in the manufactories, to depart out of this kingdom; and if any artificer has promised or contracted to go into foreign parts to practise or teach his trade, such artificer may be obliged to give security, at the discretion of the court, that he shall not go beyond the seas, and may be committed to prison until he give such security.»

These laws were rigidly enforced; and it was seldom that they were evaded. It was impossible even to smuggle a textile machine into this country; and the models that were surrepti-tiously imported were imperfect. Tench Coxe, the coadjutor of Alexander Hamilton in the Treasury Department, made arrangements to have models of Arkwright's patents sent to him; but before they could be shipped they were detected and forfeited. In 1786 the General Court of Massachusetts appointed a joint committee to investigate textile machinery; and this led later to the employment of Samuel Slater and to the real beginning of machinery-manufac-ture in this country. Slater landed at New York 17 Nov. 1789; and in the following January he made arrangements with Messrs. Brown and Almy, of Providence, R. I., to construct for them textile machinery on the English plan. He made most of the machinery with his own hands and set it up at Pawtucket, R. I. This was the first textile mill in this country to use the Arkwright system. It was opened 20 Dec. 1790. It must be remembered that Slater brought with him from England no implements to work with, and no plans or models. He had to depend entirely upon his memory. Alexander Hamilton called him "the father of American manufactures"; but, in the first place, he was the father of American machinery. Up to the time of his country there were no machines in this country. coming there were no machines in this country, with the exception of the rude saw-mill, gristmill and fulling-mill; some rolling and slitting mills, foot-lathes, and a few home-made carding and spinning appliances. The first carding-machine worked in the United States was constructed at Newburyport, Mass., in 1793, by John and Arthur Scofield. Until then the household looms were the only domestic source of supply of woolen cloth.

At this time the manufacture of metal working machinery was in its infancy. The lathe was known only in its simplest form, ie, two dead centres supporting the work as it was rotated backward and forward by a band around it, one end attached to a spring-pole above it, the other end to the foot of the operator, who held the turning-tool in his hand. Even after the lathe had been provided with a revolving spindle and centre to support and rotate the work, the tools used for turning both wood and iron were still manipulated by hand. The increasing demand for accurately-cut cylindrical iron pieces, which could not be made by hand, led to the general use of the slide-rest. Formerly used only by the optician and the maker of mathematical instruments, it now became a necessary adjunct of the mechanic's lathe. This gave the lathe practically unlimited capacity to turn out exact cylindrical work; but in order for the slide-rest to do its work, it had to be manipulated by the workman. The next step was naturally the introduction of the slide-lathe, by which the rotation of the work and the advance of the cutting tool are accomplished automatically. Owing to the lack of suitable tools to make the long flat surfaces required in such a machine, the slide-lathe had a curious development. The hammer, file, cold-chisel and straight edge were the only tools at hand. The planing-machine was the development of a demand for greater accuracy in the slide-rest. It marked an era in the life of the machinist as great as that of the slide-rest itself. It is doubtful when the first planing-machine was made in the United States; but we know that there were only four such machines in this country in 1838. With this machine the rough and uneven surfaces of castings could be smoothed and reduced to true planes. Up to this time the drill had been limited to a revolving vertical spindle. The boring-mill or vertical lathe was now possible and took its place in the machine-shop for the execution of a large class of turned work that did not require to be supported on centres, such as wheels to be keyed upon their shafts. In fact, the first development of the planing-machine was the key-seating machine. It was soon recognized that such a machine could be turned to other work, and further changes were made accordingly. It was provided with compound slide-rests, with a revolvable table mounted thereon and in this form it took its place as a standard tool in the machine-shop under the name of the slotting-machine. This planer, with its vertically movable tool, was the progenitor of a machine with similar attachments, but with its tool moving horizontally, upon which work could be conveniently shaped in a great variety of forms; and the shapingmachine, as it was called, soon became one of the standard tools of the machine-shop Meanwhile, the old vertical spindle drill, with its compound tables, movable vertically and adjustable horizontally, in two directions at right angles with each other, had been supplemented by the horizontal drill, with similar tables, but with its drill-spindle parallel to the tables; and the further requirements in this direction had been supplied by the radial drill, in which the vertical drill-spindle is movable about a vertical axis, to

which it is adjustable radially.

However, there were other factors entering into the development of our machinery industry. There were other requirements beside these machine-tools, and which these supplied inadequately. Screw-bolts and nuts were needed for putting the machines together. Originally iron screw-bolts had been made by means of a split die provided with spiral threads, by rotating either the bolt or the die backwards and for-wards until the thread was partly cut, while a taper-tap was screwed into the nut first from one side, then the other, until the bolt was found to fit into the nut. These bolts were not interchangeable. This primitive system of bolt-manufacture continued until 1847, when the solid die with sectional threads patented by Philetus W. Gates was generally introduced. This die cut the thread at one pass, then the rotation was reversed to unscrew it from the bolt, which marked the thread and was liable to mutilate the die. No compensation for wear was possible. Nothing approaching perfection was attained until 1857, when William Sellers devised a boltmachine in which dies to cut the thread at one pass, and adjustable to size, could be opened and closed while running continuously in one direction Since then ordinary screw-bolts have been made interchangeable. In a few years this machine of Sellers' was introduced into England and also continental Europe. The first turret lathe was built by Stone in 1854. It was provided with automatic mechanism for turning the turret in 1855, and perfected to its present condition in 1858. The gear-cutter was another of the early machine-shop tools. This was simply a revolving militing-cutter, mounted those a spina revolving milling-cutter, mounted upon a spindle above the dividing-plate. The wheel to be cut was forced against this. The machine was adjusted by hand. Such work was slow and very expensive; and up to 1867 the teeth of nearly all wheels, even for fine machines, were cast. In this year a machine was devised by William Sellers which limited the work of the operative to adjusting the wheel to be cut to the cutter. The machine was otherwise automatic; and it was now possible for one workman to attend to several machines, thereby greatly diminishing the cost of such work. From that time cast wheels have been no longer allowable in first-class machines. Another typical machinetool that deserves mention is the milling ma-chine. It has received its greatest development in this country. The manufacture of metalworking machinery has become highly specialized, and only the older establishments produce a number of different types of machines. New establishments usually make only one type of machine, or at most one class embracing tools of similar type. Some establishments make only engine-lathes, others only planers, others nothing but milling-machines. The effect of specialization has been to make machine-tools more efficient, and, it may be added, more varied. If, for instance, a new construction is designed, as in the automobile, or airplane, and strangely fashioned parts are required, a machine that will make these parts is always forthcoming.

The development of more accurate machinery, as indicated above, led to the system of interchangeability. In the manufacture of machinery this is an economic principle of the greatest importance. Under more primitive methods individual parts had to be fitted together with great difficulty and at much expense. Now all these parts are made by machines with such exactness that they are completely interchangeable; and there is no longer any question as to their fitting. This method of manufacture has increased the output of the individual workman and reduced the cost of production tremendously. Though first applied in Europe, it remained for the United States to demonstrate its feasibility and actually put it into successful operation, and it is generally referred to as the American system. For the economical manufacture of any kind of machinery in which many parts are to be inter-changeable certain definite conditions must be met; and success economically requires that every part shall be finished without the intervention of a skilled workman. The machine must be so designed that it will not only work automatically but work with a high degree of accuracy. Reference standards must be provided with which to compare the several parts in order to determine the amount of variation permissible between the standard and the product; every part must come from the machine in the final finished form. Such are some of the details that make necessary a careful study of every part in order to design a machine that will perform each operation with the most efficiency.

The principle of interchangeability was first suggested and put into operation in a small way by Le Blanc, in France. Its importance and possibilities were at once recognized by American inventors, and its first application in the United States was in the manufacture of firearms in our government arsenals under the direction of Eli Whitney, the inventor of the cotton-gin. Simeon North, a maker of pistols, and a neighbor of Whitney, also adopted the system. By 1818 both of these men were using drilling and filing jigs. The growth of the system was slow, being confined for a time to the principal parts, but over in this undertaint. principal parts; but even in this undeveloped condition it proved successful economically. In 1822 Calhoun, who was then Secretary of War, remarked to Whitney that his improvements were saving the government \$25,000 a year at the two public armories. The drop-hammer and dies were first used by Hall, at Harper's Ferry in 1827. Whitney adopted this machinery and thus was able to cut from red-hot metal all and thus was able to cut from red-hot metal all the smaller parts of a gun in a form closely approximating the finished article. These forged parts were then subjected to the more accurate milling-machine, which turned out the parts in uniform condition, no matter how varied their shape may have been when they came from the forging-press. It only remained for the drill to fashion the bearings for the working parts and bore the holes to secure the parts together. This was a comparatively simple matter when once the order of procedure had been determined and the guiding templets or jigs provided. The wooden stocks of the gun were also made by machinery and with sufficient accounts to make the sufficient accounts to make the sufficient accounts. curacy to make them interchangeable. This was accomplished by means of a turning-lathe designed by Thomas Blanchard and patented by him in 1820. After the stock came from the lathe the groove for the barrel and the cavity for the lock were hollowed out by special

machinery. Measured by the standards of today all this work was crude; but the gun of that day was itself crude, and these roughly interchangeable parts served their purpose. Machinetools were then both maccurate and limited in variety, so that they could not be expected to turn out the various parts with mathematical accuracy. Further, at that time there were no such delicate measuring instruments as we have to-day. The most refined measuring instrument known then was the vernier caliper; and the smallest deviation from the standard that could be detected with this continuance was, at best, perhaps the thousandth part of an inch. In 1848 the interchangeable system was applied to watch-making at the Waltham factory, and in 1850-51 it was adopted for sewing-machines. The profiling machine was developed between 1848 and 1852 by F. W. Howe and E. K. Root. Since then have come great developments in the quality of machine-tools and in their wonderful adaptability to changing needs. Measuring in-struments have now been so highly developed that a variation of the twenty thousandth part of an inch can be detected immediately and with perfect accuracy.

Foreign countries did not remain indifferent to the success of the United States in the employment of the principle of interchangeability of parts. Various commissions were appointed to investigate the system; and, as remarked above, the economic success of the United States and shortly afterward a British commission bought from them aful outfit of machinery for making the Enfield rifle on the interchangeable system. Between 1870 and 1880 our large machinery manufacturers were kept busy filling foreign orders, especially for gun machinery. Large orders for such machinery were received from the German government; and it was even stipulated in the contract that the manufacturers should send over men to set up the machinery and instruct native workmen how to run it. Other governments began to look to us for their machinery; and thus our system for the manufacture of interchangeable parts was gradually established in England and continental Europe. established in England and confinence Europe. This principle of interchangealulity, first applied to the manufacture of fire-arms, then to pistols, has now been extended to practically every kind of machine. The sewing-machine, the typewriter, the bicycle, the watch, the various kinds of agricultural machinery, the castoline engine and notably in the automobile. gasoline engine, and notably in the automobile, may be mentioned as types showing the eco-nomic value of the principle of interchangeability. All our large machinery manufacturers are represented in foreign countries, and certain types of American typewriters, sewing-machines, cash registers, mowing-machines, reapers, etc., are just as well known there as they are here. American textile machinery and shoe-making machinery play an equally important part.

The giving of detailed information of the entire machinery-manufacturing industry of the United States is well nigh impossible, due to its many ramifications, but the following facts and figures are both interesting and instructive. The machinery manufacturing industry includes many categories, chief of which in value of products is the automotive industry. Following

in order are motor vehicle bodies and parts; elecmachinery; agricultural implements; mechanical refrigerators, machine tools and foundry and machine shop products and forgings. Other classifications, as given in the census of manufactures, are gas machines and gas and water metres; pumps and pumping machinery; sewing machines; textile machinery; typewriters and supplies; washing machines and ironers; locomotives and railway cars; ships, and engines and water wheels. The total value of motor vehicles and of automobile bodies and parts in 1938 was \$5,176,235,000 The 1,067 establishments engaged in these industries in that year employed 478,341 workers and paid out \$756,080,000 in wages. The number of plants engaged in the making of carriages, wagons and sleighs showed a steady decline during 24 years from 1914 to 1938. In 1914 there were 4,662 establishments. In 1927, the number had declined to 117 and in 1938 the total number of plants was 43 with a total output of products valued at \$9,138,453. Heavy transportation machinery such as loco-motives and railroad cars also declined mateoutput, the total value of locomotives being only \$72,123,000. rially in number of plants and in value of

In 1938 the number of establishments producing machinery, exclusive of those making transportation products, was 6,876. These plants employed 816,948 workers who earned \$1,180,-429,000 in wages and produced output valued at \$4,790,151,000. In 1927 the number of establishments was 12,037; the number of workers was 886,427; the wages paid amounted to \$1,287,-778,000 and the value of the product was \$5,-

368,015,000.
The number of establishments making transemployed 615,064 workers and the total of wages paid amounted to \$957,098,000. The value of the output of the plants was \$5,910,699,000 In 1927 the number of plants was 2,537 and in these 494,-905 workers were employed and earned wages totaling \$803,298,000. The output of finished product was valued at \$4,693,972,000. In 1914 there were 7,818 plants; 312,562 employees who earned \$230,615,000 and the output totaled \$1,-

137,423,000 in value.

The value of machinery manufactured in 1938, exclusive of transportation equipment, totaled \$4,790,151,000. Agricultural implements, including tractors, made in that year were valued at \$554,778,000. Electrical machinery was valued at \$1,622,098,000. Electrical refrigerators had a value of \$363,178,000. Foundry and machine shop products and forgings had a value of \$520,-138,000. Engines and water wheels produced were valued at \$194,695,000; pumps and pumping equipment, \$198,721,000; machine tools, \$260,-242,000; sewing machines, \$34,835,000; washing machines, \$69,888,000. Aircraft production in 1938 was valued at \$106,568,000 against \$21,-162,000 in 1927 162,000 in 1927.

See HARDWARE INDUSTRY; FARM MACHIN-ERY; and articles on special types of machinery.

MACHPELAH, măk-pē'la, Cave of, Hebron, Palestine; in Old Testament history the burial place of the patriarchs Upon the traditional site stands a superb mosque which only Mohammedans are permitted to enter, although by a special firman of the sultan the Prince of Wales visited it in 1862, the Marquis of Bute in 1866 and the Crown Prince of Prussia in 1869. MACHRAY, ma-krā', Robert, Canadian Anglican archbishop: b. Aberdeen, Scotland, 17 May 1831, d. Winnipeg, Canada, 9 March 1904. He was graduated at King's College, Aberdeen, in 1851, and from the Sidney Sussex College, Cambridge, in 1855. He was of Presbyterian stock, but joined the Church of England and was ordained deacon in 1855 and priest in 1856. He was appointed vicar of Madingley, near Cambridge, in 1862, and in 1865 he was Ramsden preacher at Cambridge. He was appointed bishop of Rupert's Land, Canada, in 1865, and was consecrated in May of that year. His diocese covered 2,000,000 square miles of territory with headquarters at the then hamlet of Winnipeg, and but 18 clergymen to assist him. He was active in the promotion of education, renewed and reorganized the defunct Saint John's College at Winnipeg, and himself lectured in ecclesiastical history, liturgiology and mathematics. He was one of the founders of Saint John's Ladies' College, and upon the establishment of the University of Manitoba in 1877 he became chancellor, retaining the office until his death. He had meantime organized his diocese with a view to serving the fast-increasing population. He became metropolitan of Canada under the primacy of the archbishop of Canterbury in 1875, and upon the union of the Canadian Anglican churches in 1893, he became archbishop of Rupert's Land and primate of all Canada. Consult Machray, Robert, 'Life of Archbishop Machray' (1909).

MACHUELO, ma-chwa'lo, Spanish name current in the West Indies for the thread herring (q.v.), an medible, shad-like fish (Opisthonema oglinum) of the Atlantic coasts of the United States and the waters of the West

Indies

McILHENNEY, Charles Morgan, Amerıcan landscape paintér: b. Philadelphia, 4 April 1858; d. 1904. Having studied under Frank 1858; d. 1904. Having studied under Frank Briscoe, he continued his training at the Acad-emy of Fine Arts in Philadelphia, and soon began to win recognition in his chosen field. Among Lis best-known works are 'A Gray Summer Noon' (1884), and 'The Passing Storm' (1887); 'Old Friends' (1891); 'On the Beach' (1891); 'Gray Morning' (1892); 'September in the Marshes' (1893). In 1893 he was awarded medals at the Columbian Exportion and was the first Hallenton series. sition and won the first Hallgarten prize.

sition and won the first Hallgarten prize.

McILVAINE, māk'īl-vān', Charles Pettit,
American Protestant Episcopal bishop: b. Burlington, N. J., 18 Jan. 1799; d Florence, Italy,
13 March 1873. He was graduated at the
College of New Jersey (now Princeton University), in 1816; entered the Princeton Theological Seminary in the same year, and was
ordained deacon in 1820 and priest in 1821. His
first pastoral charge was at Georgetown, D. C.,
which he left in 1825 to become professor of
ethics at the United States Military Academy,
West Point. He became rector of Saint Ann's
Church, Brooklyn, in 1830, and in 1831 under-West Foint. He became rector of Saint Ann's Church, Brooklyn, in 1830, and in 1831 undertook the duties of the professorship of the evidences of religion and sacred antiquities in the New York University. He did not long hold the chair, however, as he was the next year elected bishop of Ohio, to succeed Bishop Chase, who had resigned the see. The question of the legality of such a resignation question of the legality of such a resignation excited considerable interest in the General Convention of that year, but in the interest of the

diocese both houses agreed in approving Dr. McIlvaine's testimonials, and he was accordingly consecrated in Saint l'aul's Chapel, New York. Upon his removal to Ohio he was elected president of Kenyon College, Gambier, founded by Bishop Chase, and held the position until 1840, acting also for some years as president of the theological seminary in the same place. During his long episcopate he came to be recog-nized as one of the most influential leaders of the Evangelical or Low Church party in America, and his ability and courtesy were cordially recognized by those who differed from him most widely. During the Civil War he was one of the four ambassadors informally appointed by President Lincoln to set before the English people what was considered in the North the real significance of the War. He published various sermons, addresses and more important

various sermons, addresses and more important theological works, mainly directed to defending the positions of his party in the Church.

McILWRAITH, māk''l-rāth, Jean Newton, (Jean Forsyth), Canadian author, daughter of Thomas McIlwraith (q.v.): b. Hamilton, Ontario, 1871. She was educated at Ladies' College, Hamilton, and studied English literature in the correspondence classes of Ouen ture in the correspondence classes of Queen Margaret College, Glasgow, for 10 years, engaging in editorial work in New York in 1902. She is a frequent contributor to magazines she is a frequent contributor to magazines and is author of 'History of Canada' in 'Children's Study Series' (1899); (Joint author with William McLennan) 'The Span o' Life' (1899); 'The Curious Career of Roderick Campbell' (1901); 'The Little Admiral' (1924); 'Kinsmen at War' (1927).

McILWRAITH, Thomas, Canadian ornithologist: b. Ayreshire, Scotland, 1824; d. 1903. He was educated in Scotland and emigrated to Hamilton, Ontario, in 1853, where he spent the remainder of his life. He became known through his classification of the birds of Canada and his study of their habits, which subject he pursued as a recreation. He was a member of the con-ference of American ornithologists held in New York in 1883, out of which came the American Ornithologists' Union. He served for many years as superintendent of the district of Ontario for the Migration Committee of the American Ornithologists' Union His first report of Canadian birds was published in the Canada Journal in 1861, and his 'Birds of Ontario' was published by the Hamilton Association (1886; author's ed.,

McINTIRE, Samuel, American wood carver and architect: b. Salem, Mass.. Jan. 1757; d. there 6 Feb. 1811. His mfluence upon archi-American wood tecture is exampled principally in his native town, where houses of his design, construction and ornamentation are preserved and give to one of the streets such distinction that it has been termed the most beautiful of our colonial streets. McIntire had carved figureheads for sailing vessels, which made Salem foremost of seaports in the colonies and known to the Indies and China, and then he began building houses for the great merchant ship owners. They were most substantial structures, the house itself one of a group of buildings, four-square and three stories in height, the whole surrounded by a massive fence. They differed from other homes of this general plan in their details, in their heavily ornamented entrance ways, hallways, staircases and room decorations, wherein the wood carver

displayed his art in a manner that remains un-

surpassed in this country.

His design entered into the Peirce house of 1779, and in 1780 he began the Derby house near the Derby wharf, and later the Boardman house on the Common, and the Forrester house. Meantime he was called upon to design other buildings such as the Assembly house and the court house in Salem, and in 1792 he submitted a design for the national Capitol New influences were coming into American architecture in favor of more graceful forms, and McIntire did not hesitate to embody the new style in his plans, following after Bullfinch, and Adam in England, so that many of his later houses show less of massiveness and more of elegance. In the Read house he used carvings such as baskets of fruit and sprays of grapes which typify his methods of decoration. He displayed the new fashion in redesigning one of the Derby houses, the "Mansion," and carved many pieces for it from capitals to beading. As richly decorated was "Oak Hill" at l'eabody, the home of a Derby daughter, the carvings here added to by McIntine's son Samuel after his death. Three of the rooms of this house have been transferred to the Boston Museum of Fine Arts and are described in a publication of the Museum. Decorations were also removed which are in the Pennsylvania Museum of Art.

His later houses were all built of brick, and included the Woodbridge and Tucker houses, and many carvings of his are found in other houses, not only as interior woodwork but m pieces of furniture bearing his characteristic ornaments of baskets, rosettes, eagles, the grape and laurel, and others used by him. Eagles he worked in on gateways, homes and large buildings, and some of these may be seen in the Essex

Museum of Salem.
After his death it was said of him that all the improvements in Salem for thirty years had been under his eye. His son carried on carving,

been under his eye. His son carried on carving, but died in 1819; and a brother, Joseph, and his son followed the art until the middle of the century. Consult Cousins and Riley, 'The Wood Carver of Salem' (1916); Swan, M. M. 'Samuel McIntire, Carver, etc.' (1934).

McINTOSH, Lachlan, American soldier: b. near Inverness, Scotland, 17 March 1725; d. Savannah, Ga., 20 Feb. 1806. He came with his father to Georgia in 1736, received there an ordinary English education, became a clerk in ordinary English education, became a clerk in the mercantile establishment of Henry Laurens at Charleston, S. C., and was later employed as a land surveyor. At the opening of the Revolution he was made colonel of the 1st Georgia battalion, and became a brigadier-general in 1776. In 1777 he fought a duel with Button Gwinnett (q.v.), who was fatally wounded. In 1778 McIntosh was selected by Washington to lead a small force against the Western Indians, whom he subdued. In the siege of Savannah, 1779, he bore an active part. When Charleston surrendered to Sir Henry Clinton 12 May 1780 McIntosh was taken pricaper and he May 1780, McIntosh was taken prisoner, and he never resumed his command. He was a member of the Continental Congress in 1784, and the next year as commissioner to the Indians he

finished his public services.

MacINTOSH, William, a half-breed Creek chieftain, son of a Scottish trader: b. about 1780; d. 1 May 1825. In 1802 the United States undertook to extinguish the Indian titles to

Yands within the borders of Georgia and in 1805 millions of acres of Creek lands were transferred to Georgia The Creeks becoming alarmed at the prospect of being deprived of all their lands, on the motion of MacIntosh, now a chief, made a law in general council in 1811 forbidding the sale of any of the remaining land under penalty of death MacIntosh led the Creek allies of the Americans in the War of 1812 with the rank of major and took the chief part in the massacre of 200 hostile Creeks at Atasi on 29 Nov 1813. He also took part in the battle at Horseshoe Bend, Ala., 27 March 1814 More lands were acquired by treaty in 1818 and in 1821 another treaty was negotiated by the Georgians with MacIntosh, who was in the pay of the whites, and other chiefs controlled by him, while 36 chiefs refused to sign and demanded a general council. In 1824 about 10,000,000 acres still remained in the hands of the Creeks and in that year they re-enacted the law punishing with death any Creek who ceded land In 1825 the whites, with bribes, induced MacIntosh and the chiefs under his control to sign a treaty ceding the remaining Creek lands The treaty was approved by President Adams, but the Creeks did not rise in rebellion; they passed formal sentence of death on MacIntosh, which a party of warriors carried out.

MACK, Norman Edward, American politician and newspaper publisher b. Buffalo, N. Y, 24 July 1858 He received a public school education, engaged in business and in 1879 established the Buffalo Sunday Times. In 1883 he began the publication of the Daily Times, of which he continued owner and editor. He was a delegate to the Democratic National Conventions from 1892, served as a member of the Democratic National Committee from 1900 and became its chairman in 1908. Died 26 Dec. 1932.

MACK VON LEIBERICH, Karl, BARON, Austrian military officer: b Nennslingen, Bavaria, 24 Aug. 1752; d Saint Polten, Austria, 22 Oct 1828. He entered the army of Austria in 1770, and was in 1797 created field-marshal After the peace of Campo Formio, he was appointed by the king of Naples to the command of his troops, and took the field against the French and occupied Rome; but a riot in Naples, caused by his having concluded an armistice with the French, forced him to take refuge in the French camp (1798). He was carried prisoner to Paris, but escaped in 1800 and in 1805 was sent to check the French advance alone the line of the Iller. But the enemy shut him up in Ulm, and on 17 October Mack capitulated with his army. He was tried by court-martial, but the sentence of death was commuted by the Austrian emperor to expulsion from the army and 20 years' imprisonment. In 1808 Mack was liberated, and in 1819 fully pardoned

McKAY, măk-ī', Alexander Charles, Canadian educator: b. Beamsville, Ontario, 2 June 1861. He was educated at the universities of Toronto and Cambridge, England He became professor of mathematics and physics at McMaster University in 1890, later holding the offices of dean of arts and registrar, and in 1905 he was elected chancellor of the university. After 1911 he was the principal of the New Technical School, Toronto. He col-

laborated in the preparation of mathematical textbooks

MACKAY, ma-kā' or ma-kī, Charles, English poet, journalist and miscellaneous writer: b Perth, Scotland, 27 March 1814; d London, 24 Dec 1889. He was editor of the *Illustrated London News*, 1852–59, lectured in the United States, 1857–58, and was a special correspondent of the London *Times* in New York during the Civil War (1862–65). He was famous for his songs, many of which he set to music of his own 'Cheer, Boys, Cheer,' is the best known of these.

MACKAY, Clarence Hungerford, American capitalist: b. San Francisco, 17 April 1874; d New York, 12 Nov. 1938 The son of J. W. Mackay (q.v.), he succeeded on the death of his father to his vast business interests. Much of his boyhood was spent in France, and he was educated in Vaugirard College, afterward studying at Beaumont College, Windsor, England. He was chairman of the Commercial Cable Company, the Postal Telegraph-Cable Company, the Commercial Pacific Cable Company, the Mackay Companies, the Commercial Cable Building Company and the Postal Telegraph Building Company and the Commercial Cable Company of Cuba. He was also a director of the North American Telegraph Company and the Metropolitan Opera Company. He was one of the prime movers to raise funds for the purchase of the log cabin in which Abraham Lincoln was born.

McKAY, Donald, American shipbuilder: b. Nova Scotia, 1810; d. 1880 He went to New York and learned shipbuilding, and began the business at Newburyport, Mass At East Boston, in 1845, he established a shippard where he built many large trading ships of the clipper model, in which he made great improvements. The Great Republic, which he built in 1853, a ship of 4,500 tonnage, was a larger vessel than had ever before been seen.

MACKAY, George Eric, English poet, son of Charles Mackay (qv): b London, 25 Jan. 1851; d. 2 June 1898. Among his works are 'Songs of Love and Death' (1865); 'Ad Reginam' (1881); the popular 'Love Letters of a Violinist' (1886); 'A Lover's Litanies' (1888); 'Nero and Actæa,' a tragedy (1891); 'My Lady of Dreams' (1895); 'Arrows of Song' (3d ed, 1896); 'A Lover's Missal' (1898).

McKAY, Gordon, American inventor and manufacturer: b Pittsfield, Mass., 1821; d. Newport, R. I., 19 Oct. 1903. He was the son of a cotton manufacturer, and at 12, on the death of his father, learned civil engineering, at which he worked for some time. Before he was 21 he built a machine-shop in Pittsfield which employed 100 men, and later became treasurer and manager of the Lawrence Machine Company. He was the first successful inventor of machinery for making boots and shoes; he perfected a shoe sewing-machine, invented, but not made practicable, by L. R. Blake, of Abington, Mass; afterward invented the heeler, lasting-machine, nailing-machine, etc., which came into general use; and by these inventions revolutionized the boot and shoe industry of the world. At the outbreak of the Civil War he offered to make the shoes for the Union army, and within three years had leased his

machines to more than 60 firms, and shortly became a millionaire. In 1878 he formed the McKay Sewing-Machine Association, a strict monopoly which exacted commissions on all shoes made in the United States by the aid of his inventions, and also brought profit through European royalties. In 1893 he placed \$4,000,000 in a trust fund for Harvard University. He made many other liberal donations for benevolent and educational objects, and established near Kingston, R. I., the McKay Institute for the manual training of colored youth. By his will the greater part of his estate was left to Harvard.

Mackay, Jessie, Australian poet and prose writer b Cambridge, New Zealand, 15 Dec. 1864. She combined teaching with literary work and has been a voluminous contributor to the Australian press, with the readers of which she is a favorite. Among her published works are 'The Spirit of the Rangatira and Other Ballads' (1810); 'The Sitter on the Rail and Other Poems' (1891); 'The Bride of the Rivers.'

MACKAY, John William, American capitalist: b. Dublin, Ireland, 28 Nov. 1831; d London, 20 July 1902. His parents brought him to New York in 1840, and he learned shipbuilding. He went to California as a miner in 1851, and afterward to Nevada, where he continued mining with great perseverance in the face of many disappointments. In 1872 he was one of the discoverers of the Bonanza mines of the Comstock Lode (qv.), in which mines he obtained a two-fifths share and became very wealthy He and his partners, Fair, Flood and O'Brien, founded the Bank of Nevada, of which Mackay was president for years His relations with Jay Gould being unfriendly, in a spirit of opposition to him, and to the Western Union Telegraph Company, Mackay in 1884 joined with James Gordon Bennett in forming the Commercial Cable Company and the Postal Telegraph Company. He succeeded in laying two cables, overcoming great obstacles, and afterward won in a long rate-war with the old lines. The Roman Catholic Orphan Asylum at Virginia City, Nev, founded by him, is noteworthy among his many public benefactions

MACKAYE, ma-kī', James Steele, American playwright b Buffalo, N. Y., 1844; d. Timpas, Colo, 25 Feb. 1894. In 1868 he went to Paris to study painting; but having there met Delsarte (q.v.) became interested in the latter's theories, and studied dramatic expression. In 1870-71 he gave in New York and Boston lectures on the art of expression. He opened the Saint James Theatre at New York in 1872, and appeared there in 'Monaldi,' adapted by himself from the French In 1873-75 he was studying the drama in Paris and England, and at the Crystal Palace, London, he played the title-rôle in 'Hamlet.' His adaptation of Blum's 'Rose Michel' in 1872 ran for 122 nights at the Union Square Theatre, New York. He established in New York the Lyceum School of Acting, which later became the American Academy of Dramatic Arts. For several years he was manager of the Madison Square Theatre, and in 1885 built the Lyceum. Among his further plays were 'Won at Last'; 'Through the Dark'; 'Hazel Kirke'; 'A Fool's Errand'; 'In Spite of All'; 'Paul Kauvar.'

Consult Mackaye, Percy, 'Steele Mackaye: A Memon' (New York 1911).

MACKAYE, Percy, American dramatist and poet: b New York, 16 March 1875. He was graduated from Harvard in 1897 and studied at the University of Leipzig in 1899. 1900. He engaged in European travel in 1898-1900, residing in Rome, Switzerland, Lopzig and London. He was an instructor in a private school in New York in 1900-04, after which time he joined the Cornish Colony in New Hampshire and devoted his time entirely to dramatic work. He has lectured on the to dramatic work. He has lectured on the theatre at Harvard, Yale, Columbia and other American universities, and is a member of the National Institute of Arts and Letters. He is a leading exponent of poetic dramatic art in America and handles both tragedy and comedy with grace and surety of touch. Author of 'The Canterbury Pilgrims,' a comedy, produced by the Cobum Players in the open air at Harvard, Yale and other universities in 1909-13, and given as a civic pageant in honor of President Tast at Gloucester, Mass., 4 Aug. 1909 (1903); 'A Modern Rendering into Prose of Chaucer's Tales' (1904); 'Fenns the Wolf,' a tragedy (1905); 'Jeanne d'Arc,' a tragedy, produced by Julia Marlowe and E II Sothern in America and England in 1906 07 (1906); 'Sapple, and Phoenica travels (1907). (The Marrica and England in 1900 of (1900); (Sappho and Phaon, a tragedy (1907); The Scatecrow (1908); 'Lincoln Centenary Ode' (1909); 'Matei,' an American comedy (1908); 'The Playhouse and the Play,' essays (1909); 'A Garland to Sylvia' (1910); 'Anti-Matrimony' a satirical council program of the control of th essays (1909); 'A Garland to Sylvia' (1910); 'Anti-Matrimony,' a satirical comedy produced and acted by Henrietta Crossman (1910); 'The Civic Theatre' (1912); 'Uriel and Other Poems' (1912); 'Beauty and the Beast,' a lyric drama (1912); 'Sanctuary, A Bird Masque,' produced for President Wilson at Meriden Bird Club Sanctuary, New Hampshire (1913); 'The Immigrants,' a lyric drama (1915); 'The Evergreen Masque' (1917); 'This Fine Pretty World'; 'The Sphinx' (1929).

McKEAN, ma-kēn', Thomas, American pa-Independence: b. New London, Chester County, Pa. 19 March 1734; d. Philadelphia, 24 June 1817. He was privately educated at Newcastle, Del.; having settled there, he studied law and was admitted to the bar, in 1755, at once he was admitted to the bar in 1755, at once became register of probate and was soon made assistant attorney for Sussex County. Cæsar Rodney (qv.), in 1762, he entered upon a revision of Delaware laws up to 1752, and was chosen in the same year to the Delaware assembly, in which his membership continued Elected in 1765 to the Stamp Act Congress, he took a strong position in defense of colonial rights and as judge of the Common Pleas in the same year permitted no stamped paper to be used in his court About 1771 he began to practise law in Philadelphia, although retaining a Delaware residence, and from Delaware, in 1774, he was elected to the Continental Congress. in which he served nine years, including the entire period of the Revolution, and took a prominent part in its proceedings, being president of the Congress in 1781. He was not present at the signing of the Declaration of Independence, which he had advocated, but added his signature some years afterward. The

Articles of Confederation, which he aided in drafting, were also signed by him. In Pennsylvania, where he had become well known, he was made chairman of the Committee of Safety in 1776, and from 1777 to 1799 was chief justice of the State. He became a strong supporter of Jefferson, and a leader of the Republican party of that day, and was governor of Pennsylvania from 1779 to 1808. With James Wilson he wrote 'Commentaries on the Constitution of the United States' (1790).

McKEAN, Thomas, American philanthropist. b. Philadelphia, Pa., 23 Nov. 1842; d. there, 16 March 1898. In 1862 he was graduated at the University of Pennsylvania and entered upon a successful business career, becoming an officer in many railroad and financial corporations. He acquired a large fortune, which he spent freely in endowing educational and charitable enterprises, his various gifts to the University of Pennsylvania alone amounting to \$300,000.

McKEES ROCKS, Pa, borough in Allegheny County; on the navigable Ohio River, and Chartiers Creek; 4m. NW of Pittsburgh, served by the Pittsburgh and Lake Erie, Pittsburgh, Chartiers and Youghiogheny; and the Pittsburgh, Allegheny and McKees Rocks railroads McKees Rocks is in a coal mining and farming section, but is essentially an industrial suburb of Pittsburgh, owing to the expansion of the two communities. Manufactures include bar iron and steel; automobile and locomotive parts; steel and wooden kegs; and enamelware. The borough was the site of a trading post in 1743, a fort in 1753; was named for Alexander McKee, who acquired the land and settled here about 1764; and was incorporated in 1830. Pop. (1940) 17,021.

McKEESPORT, Pa., city in Allegheny County; at the confluence of the navigable Monongahela and Youghtogheny rivers, and on their easterly banks, 15m. SE of Pittsburgh, served by the Pennsylvania; Baltimore and Ohio; and Pittsburgh and Lake Erie railroads. There are two airports. McKeesport is the second largest city in Allegheny County, ranking next to Pitts-burgh, and is the retail center of a closely settled district, its neighboring towns including Clairton, East McKeesport, Glassport, Duquesne, Elizabeth, Wilmerding, Port Vue, and East Pittsburgh. Situated in the heart of the great Pennsylvania bituminous coal region, and the gas fields of that state and West Virginia, the city's industrial history is closely associated with the development of its natural resources. McKeesport is outstanding as one of the world's largest producers of steel pipes and tubes, a fact that has made it known to many by the sobriquet of the «Tube City» It has likewise important sheet steel and tin plate industries, and is the home of the first American manufacturers of stainless steel. Other products are shell and tool steel; steel castings; radiators and boilers; oxygen and acetylene gas; and there are meat packing plants and lumber manufactures. McKeesport is a well built city, laid out on ground rising somewhat steeply from the riveredge, and its attractiveness is enhanced by the numerous terraces that characterize its streets. There are many handsome buildings, and the newer residential section spreads advantageously upon the heights above the business and industrial districts. The city has excellent school and park systems, and an exceptional number of churches McKeesport was settled in 1755 by David McKee, a native of northern Ireland, who purchased a tract of 844 acres and from 1769 operated a ferry for which official authority was granted in 1775. The town was laid out in 1795 by John McKee, son of the original settler, 200 city lots being platted and sold. The infant town grew slowly, however, until about 1830, when the opening of the rich coal fields near by proved the start of its present high industrialization. Barge building was a considerable industry in the decades from 1830 to the 1850's, an abundance of timber supplying the busy river yards. McKeesport had its first iron works in 1851 and thereafter maintained a steady industrial expansion, passing the 20,000 population mark in 1890. A large number of the people are foreign born, the city having had successive waves of immigration, but the native born element predominates McKeesport was incorporated as a borough in 1842, and was chartered as a city in 1890. Pop. (1940) 55,355.

McKEEVER, William Arch, American educator: b. Jackson County, Kan, 12 April 1868 He was graduated at the University of Kansas in 1898, and later studied at the University of Chicago and at Harvard. He was professor of philosophy at the Kansas State Agricultural College in 1900-13, and from 1913-20 was head of the department of child welfare at the University of Kansas. He then became director of the School of Psychology, Oklahoma City. He originated the "Home Training Bulletins," and the Juvenile Welfare Institute His publications include: "Psychology and the Higher Life' (1908); "Psychologic Method in Teaching' (1909); "The Pioneer, a Story of Kansas' (1911); "Farm Boys and Girls' (1912); "Training the Boy' (1913); "Training the Girl' (1914); "Outlines of Child Study' (1915); "Man and the New Democracy' (1919); "The Child and the Home' (1923); "The Creative Mind' (1925); "Side Stepping Divorce' (1927); "You and Your Life' (1930); "Living a Century' (1935); "Campaign Against Old Age' (1937); "Create Your Own Job' (1939).

Mackellar. Thomas. American noet:

Mackellar, Thomas, American poet: b New York, 12 Aug. 1812; d. 29 Dec. 1899. Having learned the printer's trade in the publishing house of the Harpers, he went to Philadelphia and was employed in the type foundry of Lawrence Johnson and Co, in time became a partner in the business and finally its head, the new firm being styled Mackellar, Smiths and Jordan. Among his works may be mentioned 'Droppings from the Heart' (1844); 'Tam's Fortnight Ramble' (1847); 'The American Printer' (1866); 'Rhymes Atween-Times' (1873), and 'Hymns and Metrical Psalms' (1883).

McKELWAY, Saint Clair, American journalist: b Columbia, Mo, 15 March 1845; d. 16 July 1915. In 1853 he came East and was educated in New Jersey, studied law and was admitted to the bar in New York in 1866, but never practised. In 1868 he became Washington correspondent for the New York World and the Brooklyn Daily Eagle and in 1870 a member of the editorial staff of the latter paper From 1877 to 1884 he was the editor of the Albany Argus, and in the latter year returned to Brooklyn to become editor-in-chief of the Eagle,

which under his editorship maintained a high standard of excellence. He was a regent of the University of the State of New York since 1883, becoming vice-chancellor in 1900 and chancellor in 1913, a member of the historical societies of Long Island and Suffolk County, was director of the American Social Science Association and has lectured frequently on educational and political subjects.

McKENDREE, ma-kěn'drĭ, William, American Methodist bishop: b. King William County, Va, 6 July 1757; d near Nashville, Tenn., 5 March 1835 He served in the Continental army during the American Revolution, entered the Methodist ministry in 1787 and became a presiding elder nine years later. In 1801 he made a missionary tour beyond the Alleghanies and was an important factor in the evangelizing of that region. In 1808 he was elected bishop, being the first American-born person to hold that office in the Methodist Church. McKendree College (qv) was named in his honor. Consult 'Life' by Paine (1869).

Mckendree College, in Lebanon, Ill, founded in 1828 under the auspices of the Methodist Episcopal Church and first called Lebanon Seminary. In 1830 the name was changed, in honor of William Mckendree, who gave his estate to the college. In 1839 a new charter was obtained whereby the school was granted university privileges. Abraham Lincoln rendered valuable services in securing the new charter Students are admitted on certificates from approved schools or on examinations. It has classical, scientific, music, prelaw and pre-medical courses. Two main degrees are given: A.B and B.S. In normal enrolment years it has approximately about 180 men and women in the regular session.

McKENNA, ma-ken'a, James Andrew Joseph, Canadian public service commissioner: b. Charlottetown, Prince Edward Island, 1 Jan. 1862. He was educated at Saint Dunstan's College, Charlottetown, was associated for a time with the Prince Edward Island Railway and afterward engaged in journalism. In 1886 he entered the Indian Department of the Dominion Civil Service, and for a brief period was private secretary to Sir John A. Macdonald With T. G. Rothwell he effected a settlement with British Columbia concerning the administration of the railway belt lands in 1897, and in 1899 he was a royal commissioner for the negotiation of a treaty with the Indians whereby the Peace River and Athabaska Country were surrendered to the Crown. He likewise secured the surrender by the Indians of the country around Buffalo Lake, Churchill River and Remdeer Lake in 1906. He was chairman of the royal commission which was appointed to adjust the claims of the half-breeds of the Northwest, and in 1901 was the sole commissioner. After 1909 he served as inspector of Indian Catholic schools in Manitoba, Keewatin and the Northwest provinces and territories. Author of 'Sir John Thompson' (1895), and 'The Hudson Bay Route' (1907). Died 30 May 1919.

McKENNA, Joseph, American jurist: b. Philadelphia, 10 Aug. 1843. In 1855 he went to California and was graduated from the Benicia Collegiate Institute in 1865, and admitted to the bar the same year. He was dis-

trict attorney of Solano County in 1866-68, and in the sessions of 1875 and 1876 served as a Republican in the lower house of the California legislature. In 1885-93 he was a California representative in the 49th, 50th, 51st and 52d Congresses, resigning from the House in 1893 to accept the appointment to the office of United States circuit judge in the Ninth Federal judicial district. This post he resigned to become Attorney-General in the cabinet of President McKinley in 1897 On 16 Dec. 1897 he was made an associate justice of the United States Supreme Court, took his seat, 26 Jan. 1898; retired, 5 Jan. 1925. He died 21 Nov. 1926.

McKENNA, Reginald, English statesman: b. London, 6 July 1863. He was educated at King's College, London, and at Trinity Hall, Cambridge, and became a barrister in 1887. He engaged in law practice until his election to Parliament for North Monmouthshire by the Liberal party in 1895 He soon acquired a reputation as one of the hardest workers on the Liberal benches as well as for a sound knowledge of national finance and of parliamentary procedure. In the cabinet of Su Ileniy Campbell-Bannerman, formed in 1905, McKenna was appointed Financial Secretary under Chancellor of the Exchequer Asquith. In 1907 he received cabinet place as president of the Board of Education. He instituted medical inspection of the children in the schools, and reorganized the secondary school system. When the Asquith cabinet was organized in 1908 he was appointed First Lord of the Admiralty, and in 1911 he was transferred to the office of Home Sccretary, where the problems incident to the crusades of the militant suffragettes caused him considerable difficulty. The so-called "Cat-and-Mouse Act" brought severe criticism from the supporters of the suffrage movement and from the Opposition He was also prominently connected, with the Welsh Church Bill, the Mental Deficiency Act and the affairs of the Administration of Criminal Justice. Upon the formation of the coalition cabinet under Asquith, in May 1915, McKenna became Chancellor of the Exchequer, succeeding Lloyd George, who was appointed to the new post of Munister of Munitions. McKenna introduced the first heavy wartax measure and elicited high praise upon its brevity and lucidity as well as its careful dis-tribution of the burdens of taxation. When the new coalition cabinet was organized under the premiership of Lloyd George, December 1916, McKenna was succeeded by Bonar Law. In the elections of 1918 he lost his re-election from North Monmouthshire, interrupting a continuous Parliamentary career of 23 years. In 1919 he abandoned politics and devoted the remainder of his life to banking, becoming chairman of the Midland Bank, one of the strongest financial institutions in England. In 1924 he served as a member of the so-called Dawes Plan Commission. He died at London, 6 Sept. 1943.

MACKENSEN, August von, German field-marshal: b. Hausleipnitz, Saxony, 1849. Entering the army in 1869 he served as lieutenant of reserves in the Franco-Frussian War. In 1876 he became adjutant of the first cavalry brigade and two years later was made lieutenant-colonel. He was appointed to the general staff in 1882 and in 1894 became commander of the Life Hussars

Regiment and the following year was made aide-de-camp to the emperor. In 1914 he was made chief-of-staff under von Hindenburg on the Eastern Front and in 1915 he directed the German drive in the Balkans and was made field-marshal. He commanded the German right in the drive on Warsaw and forced the Russian evacuation of that city. In 1916 he subjugated Rumania in conjunction with von Falkenhayn. After the Armistice, he was interned by the French at Neusatz, where, over the protests of the Germans, he was kept until 1919.

MACKENZIE, ma-kĕn'zĭ, SIR Alexander, Canadian explorer: b. Stornoway, Scotland, 1763; d. Mulnam, Perth, 12 March 1820. He went to Canada and in 1789 explored the great river named after him from the western end of Great Slave Lake to the Arctic Ocean, made another expedition to the western coast (1792), and was the first white man to cross the Rocky Mountains and reach the Pacific Coast. He returned to Britain in 1801, and was knighted in 1802. He published 'Voyages from Montreal through the Continent of North America to the Frozen and Pacific Oceans in 1789 and 1793' (1801).

MACKENZIE, Alexander, Canadian statesman. b Logierait, Perthshire, Scotland, 28 Jan. 1822; d. Toronto, Ontario, 17 April 1892. He emigrated to Canada in 1842. For five years he worked at the trade of a stonemason at Kingston, but then removed to Sarnia, where he became a contractor. But his chief interests were political, not commercial In 1852 he began the publication of the Lambton Shield, and soon became conspicuous as one of the Liberal leaders. He entered the Canadian Parliament in 1861, and after the Confederation of Canada, in 1867, sat both in the Ontario legislature at Toronto and in the Dominion Parliament at Ottawa. When Edward Blake (q.v.) became Prime Minister of Ontario in 1871 Mackenzie joined his cabinet and became Provincial Treasurer, but in consequence of the passing of a law forbidding membership of more than one legislature, he elected in 1872 to sit in the Dominion Parliament. In 1873, when the government of Sir John Macdonald was overthrown, Mackenzie, now the leader of the Liberal party, became Prime Minister of Canada and held office for five years. His too great devotion to the details of his office broke down his health. In 1878 his government was defeated by the advocates of protection, and in 1880 he was obliged by ill-health to hand over the leadership of the Liberal party to Mr. Blake.

MACKENZIE, SIR Alexander Campbell, Scottish composer: b. Edinburgh, 22 Aug. 1847. He received his musical education at Sondershausen, Germany, and at the Royal Academy of Music, London, where he won the King's Scholarship in 1862. He established himself as a teacher in Edinburgh in 1865 and soon became known as a violinist of merit. He became precentor of Saint George's Church in 1870 and was appointed conductor of the Scottish Vocal Music Association in 1873. He was a member of the orchestra at the Birmingham Festivals in 1864-73. He had composed several notable pieces for the piano at this time, and at the solicitation of friends he abandoned his work as a teacher and settled in Florence where he spent the greater share of his time from 1875

to 1885 engaged in composition. From 1888 he was principal of the Royal Academy of Music He conducted the Philharmonic concerts in 1892–99, and was knighted in 1894 Author of 'Overture, Cervantes'; the cantatas 'The Bride' (1881) and 'Jason' (1882); the operas 'Colombo' (1883); 'The Troubadour' (1886); the oratorios 'The Rose of Sharon' (1884); 'Bethlehem' (1894); incidental music for several plays among them 'The Little Minister,' 'Coriolanus' and 'Ravenswood,' and many concertos, songs, violin pieces and works for violin and orchestra. Died 28 April 1935.

MACKENZIE, Alexander Slidell (originally Slidell), American naval officer: b. New York, 6 April 1803; d. Tarrytown, N. Y, 13 Sept. 1848. He was a brother of John Slidell (q.v.) and assumed the name "Mackenzie" for an uncle in 1837. He entered the navy in 1815 and became a commander in 1841. While in command of the Somers the next year a mutiny among the naval apprentices on board was supposed to have been detected, and three of them, including a son of the Secretary of War, were hung from the yardarm on 1 Dec. 1842. He was a popular writer and among his works are (A. Year in Spain by a Young American' (1829-31; enlarged ed, 1836), which attained great popularity in England and the United States; 'Popular Essays on Naval Subjects' (1833); 'The American in England' (1835); 'Life of John Paul Jones' (1841), etc. Consult 'The Case of the Somers: Defense of A. S. Mackenzie' (New York 1843); Cooper, 'The Cruise of the Somers' (ib. 1844).

MACKENZIE, Arthur Stanley, Canadian educator: b. Pictou, Nova Scotia, 26 Sept. 1865. He was graduated at Dalhousie University in 1885, and in 1885–87 was assistant master at the Yarmouth Academy, Nova Scotia. He was scholar in physics at Johns Hopkins University in 1889–90 and Fellow there in 1890–91. He was connected with the staff of physics at Bryn Mawr College in 1891–1905, was professor of physics at Dalhousie University in 1905–10 and at Stevens Institute of Technology in 1910–11, after which he was president of Dalhousie University. Author of 'The Laws of Gravitation' (1900). Died Halifax, 2 Oct. 1938.

MACKENZIE, Charles Frederick, Anglican bishop: b. Portmore, Peebleshire, Scotland, 10 April 1825; d Malo, in the Manganja country, Africa, 31 Jan. 1862. He was graduated at Cambridge in 1848, was elected a Fellow there and was ordained a deacon in 1851. He was appointed to a curacy at Haslingfield, Cambridgeshire, in 1851, which office he filled without discontinuing his work as Fellow and tutor at Cambridge. In December 1854 he accompanied Bishop Colenzo to Natal as his archdeacon, and returned to England after a severe illness in 1859. He became the head of the Universities' Mission to Central Africa in 1860 and in 1861 was consecrated bishop of Central Africa. He was assisted by Livingstone in penetrating certain remote districts in his diocese. He died of a fever while on his way to a conference with the explorer. Consult Goodwin, 'Memoir of Bishop Mackenzie' (2d ed., 1865); Livingstone, 'Narrative of an Expedition to the Zambeezi' (pp. 348-364, 400, 410-412, 1865).

MACKENZIE, Compton, English novelist and playwright. b West Hartlepool, 17 Jan. 1883. He was educated at Saint l'aul's School and Magdalen College, Oxford, where he took the second class in modern history in 1904. He was one of the founders of the Oxford Point of View, and was its editor from 1902 to 1904. He has since occupied himself in writing novels and plays. He holds a commission as a licutenant in Royal Marines. His chief publications are 'The Passionate Elopement' (1911); 'Carnival' (1912); 'Guy and Pauline' (1915); 'Poor Relations' (1919); 'The Seven Ages of Woman' (1922); 'The Heavenly Ladder' (1924); 'The Old Men of the Sea' (1924); 'Coral' (1925); 'Fairy Gold' (1926); 'Rogues and Vagabonds' (1926); 'Dreams to Sell' (1930).

MACKENZIE, SIR George, Scottish lawyer: b. Dundee, 1636, d Westminster, 8 May 1691 He was a grandson of Kenneth, 1st Lord Mackenzie of Kintail, and a nephew of the 1st and 2d Earls of Scaforth He was educated at the universities of Saint Andrew's and Aberdeen and later studied civil law at the University of Bourges, France He was called to the bar in Scotland in 1659 and speedly rose to distinction. In 1661 he conducted the defense for the Marquis of Argyll in his trial for high treason, and soon afterward was appointed a justice-depute, or judge of the Criminal Court. In 1669 he sat for Ross-shire and rendered himself conspicuous by his opposition to Lauderdale and by his support of popular measures. He was knighted in 1674 and in 1677 succeeded Sir John Nisbet as King's Advocate. From this time Mackenzie's principles seemed wholly subverted, and in his endeavor to force submission to the king he earned for himself the appellations "Bloody Mackenzie" and "the blood-thirsty advocate." He opposed the abrogation of the penal laws against Catholics in 1686 and was removed from office until 1688, when for a year he was again King's Advocate, relinquishing the office at the outbreak of the Revolution He founded the Advocate's Library at Edinburgh in 1689, and in 1690 he retired to Oxford where he was admitted as a student and spent the remainder of his life engaged in laterspent the remainder of his life engaged in interary pursuits. Author of 'A Vindication of the Government of Charles II' (1691); 'The Moral History of Frugality' (1691); 'Methods of Proceeding against Criminals and Fanatical Covenanters' (1691); 'Vindication of the Presbyterians of Scotland from the Malicious Assertions Cost won Them' (1602) and many Aspersions Cast upon Them, (1692), and many other works of earlier date. His collected works were published (2 vols, Edinburgh 1716-22).

MACKENZIE, George Henry, American chess player: b near Aberdeen, Scotland, 24 March 1837; d. New York, 13 or 14 April 1891 He was appointed an ensign in the 60th Rifles in 1856, served at the Cape of Good Hope and in India and was promoted heutenant. He returned to England and in 1861 sold his commission. He came to the United States in 1863, joined the Federal army and rose to the rank of captain. He thereafter devoted himself to chess as a professional, already having won first prize in the London Tournament of 1862, defeating the Prussian champion, Anderson. Settling in New York in 1865 he became a member of its chess club and won first prize in

the tournaments of 1865, 1866, 1867, 1868. He won first prize at the Second American Chess Congress in Cleveland in 1871; fourth prize at the International Congress at Paris in 1878, and in 1887 he won the championship of the world at Frankfort. He was found dead in bed.

MACKENZIE, Henry, Scottish novelist and essayist b Edinburgh, 25 Aug 1745; d there, 14 Jan 1831. He was a lawyer at Edinburgh, and in 1771 published anonymously 'The Man of Feeling,' which the booksellers had declined as a gratuitous offering, and which gained him a conspicuous place among 18th century writers. Other novels of his are 'Man of the World' (1773), and 'Julia de Roubigné' (1777). He edited The Mirror, 1779 80 (the first Scottish paper founded on the plan of The Spectator), and The Lounger, 1785-87.

MACKENZIE, James Cameron, American educator: b. Aberdeen, Scotland, 15 Aug 1852. He was graduated at Princeton Theological Semmany in 1882 and was ordained in the Presbyterian ministry in 1885. He founded the Harry Hillman Academy, Wilkes-Barre, Pa., in 1882, and also organized the Lawrenceville (N J) School in that year, acting as its head master in 1882–99. In 1899 he reorganized the Jacob Tome Institute, Fort Deposit, Md, and was its director until 1901. In 1901–26 he was director of the Mackenzie School, Monroe, N. Y., and after that engaged in literary work. D. 10 May 1931.

MACKENZIE, John Joseph, Canadian pathologist and bacteriologist: b. Saint Thomas, province of Quebec, 1865; d. 1 Aug. 1922. He was educated at the universities of Toronto, Leipzig and Berlin. He was a Fellow in biology at Toronto and later was bacteriologist to the Ontario Provincial Board of Health. After 1900 he was professor of pathology and bacteriology at the University of Toronto. He contributed to various scientific magazines. He was a Fellow of the Royal Society of Canada, and member of the American Public Health Association, the Society of American Bacteriologists and of the American Association of Pathologists and Bacteriologists. He was secretary of the Canadian Institute. During the European War he was attached to No. 4 Canadian General Hospital. Author of 'Recent Theories in Regard to the Causes of Immunity to Infectious Disease' (1907).

MACKENZIE, John Stuart, British educator: b near Glasgow, 21 Fcb 1860. He was educated at Glasgow and Cambridge universities and later studied at the University of Berlin. He was a Fellow at the University of Glasgow in 1882–84, at the University of Edinburgh in 1884–89 and at Trinity College, Cambridge, 1890–96. He was professor of logic and philosophy at the University College of South Wales and Monmouthshire in 1895–1915, then becoming professor emeritus. He was a vice-president of the Institut International de Socialogie in 1911 and president of the Moral Education League in 1908–16. Besides magazine articles and contributions to the 'Encyclopedia of Religion and Ethics' he is author of 'An Introduction to Social Philosophy' (1890; 2d ed., 1895); 'A Manual of Ethics' (1893; 8th ed., 1915); 'Outlines of Metaphysics' (1902; 2d ed., 1906); 'Elements of Constructive Philosophy' (1917); 'Ultimate Values' (1924).

MACKENZIE, Sir Morell, English laryngologist: b. Leytonstone, Essex, 7 July 1837; d. London, 3 Feb 1892 He was educated at the London Hospital, Paris and Vienna. In 1859 he met Czermak in Budapest and learning from him the use of the laryngoscope he introduced its use into London Later he became physician to the London Hospital and lecturer on diseases of the throat In 1863 he founded the Throat Hospital in London In 1887-88 he was associated with specialists of Berlin and Vienna in the treatment of the larynx disease of the Crown Prince, subsequently Emperor Frederick of Germany, and for these services was knighted by Queen Victoria and received the Grand Cross and Star of the Hohenzollern Order of Germany He was the author of 'The Use of the Laryngoscope' (1866); 'Diseases of the Throat and Nose' (1880), etc.

MACKENZIE, Ranald Slidell, American soldier: b. New York City, 27 July 1840; d. Staten Island, N. Y, 19 Jan 1889 He was son of Alexander S Mackenzie (qv.) Graduated from West Point in 1862, he was assigned to the engineer corps, was wounded at Manassas and brevetted Ist lieutenant for services in that action. He was engineer of Sumner's division at Fredericksburg (13 Dec. 1862), and received the successive brevets of captain and major for his conduct at Chancellorsville and Gettysburg. Promoted captain of engineers 6 Nov 1863, he took part in the Richmond campaign as commander of 2d Connecticut Artillery. On 18 June 1864 was brevetted lieutenant-coloned and commanded the 2d Connecticut Heavy Artillery in the Shenandoah campaign. Present at Appomattox (9 April 1865), mustered out of the volunteer service 15 Jan. 1866. After the Civil War he commanded important army posts in the Southwest, and was notably successful in settling Indian troubles on the Rio Grande. Made brigadier-general 1882, retired for disabilities 1884.

McKENZIE, Robert Tait, American sculptor, educator and physician b. Almonte, Ont., Canada, 1867; d. Philadelphia, Pa, 28 April 1938 He was graduated at McGill University in 1889 and took his M.D. there in 1892. He engaged in the practice of medicine; was connected with the medical faculty of McGill in 1895–1904, and in 1904 was appointed professor and director of the department of physical education at the University of Pennsylvania. He was appointed temporary major in the R. A. M. C. in 1915, and in 1916 was inspector of physical training of Kitchener's armies, and medical officer in charge of Heaton Park Command Depot. He was a fellow of the College of Physicians at Philadelphia, and in 1912–15 he was president of the American Physical Education Association. His fame as a sculptor was achieved without artistic training, his guide being his thorough knowledge of anatomy and his unusual ability in interpretation. He exhibited at the Society of American Artists, New York; the Royal Academy, London, and the Paris Salon. Among his works as a sculptor are 'The Sprinter' (Fitzwilliam Museum, Cambridge); 'The Athlete' (Ashmolean Museum, Oxford); the statuettes, 'The Competitor' and the 'Juggler' (Metropolitan Museum, New York); 'The Youth Benjamin Franklin' (University of Pennsylvania). Author of 'The Barnjum Barbell Drill,' Exercise in Education and Medicine,' 'Reclaiming the Maimed.'

MACKENZIE, SIR William, Canadian financier: b. Kirksfield, Ontario, 30 Oct. 1849; d. Toronto, 5 Dec. 1923. He was educated at the local schools and became a public school teacher. Giving up this occupation he contracted for the construction of a portion of the Victoria Railway—now the Midland division of the Grand Trunk Railway—and later executed contracts for the Coboconk, the Credit Valley, the Canadian Pacific, the Fort McLeod and Edmonton, the Regina, the Hudson Bay and Dauphin railways and other roads. He controlled and was president of the Toronto Street Railway, was also interested in the Montreal and Winnipeg street railways, and with others controlled the Birmingham Street Railway and other European lines. His great achievement was the construction of the Canadian Northern Railway. He was knighted in 1911.

MACKENZIE, William Douglas, American Congregational clergyman b Fauresmith, Orange River Colony, South Africa, 16 July 1859 He graduated from Edinburgh University in 1881, studied divinity in Edinburgh and Gottingen, was professor of theology in the Chicago Theological Seminary, 1895-1903, and since 1903 has been president of Hartford Theological Seminary. He published 'The Revelation of the Christ' (1896); 'Christianity and the Progress of Man' (1897); 'South Africa: its History, Heroes and Wars' (1900); 'John Mackenzie, South African Missionary and Statesman' (1902); 'The Final Faith' (1910); 'Galatians and Romans' (1912); 'Christian Ethics in the World War' (1918).

MACKENZIE, William Lyon, Canadian journalist and political reformer b Dundee, Scotland, 12 March 1795; d. Toronto, Ontario, 28 Aug. 1861 In 1820 he came to Canada and conducted a drug and book store at Little York (now Toronto), and later at Queenstown, where in 1824-26 he published the Colonial Advocate. He transferred the Advocate office to Toronto in 1826, and there continued the paper until 1833, attacking the office-holding class and demanding governmental reforms In 1828 he entered the provincial Parliament; and having been expelled for alleged libel against that assembly, was five times re-elected and as often re-expelled, until the government refused to issue another writ of election In 1832 he went to England, and having presented to the home government a petition of grievances from the Canadian reformers, was successful in obtaining the dismissal of the attorney-general and the solicitor-general of Upper Canada and the veto of the Upper Canadian bank bill In 1834 he was elected first mayor of Toronto, in 1836 began the publication of The Constitution, and, in 1837 published in that journal a bold manifesto which was practically a declaration of in-dependence of the provincial government. Soon afterward he was the moving spirit in armed rebellion. An encounter took place between his followers and the government forces at Montgomery's Tayern, in the vicinity of Toronto (7 Dec 1837), and the insurgents fled to Navy Island in the Niagara, where they were joined by about 500 Americans. The island was bombarded by Canadian troops, and as a result of this and the strong opposition of General Scott of the United States army, the insurgents broke camp and Mackenzie was imprisoned for a year in Rochester jail Later he was a journalist in the United States, in 1849 took advantage of amnesty to return to Canada, was there a member of Parliament from 1850-58, and at Toronto published the weekly Mackensie's Messenger from 1858 until shortly before his death. The reforms for which he so persistently contended were in the main achieved in his lifetime. He wrote 'Sketches of Canada and the United States' (1833). Consult the 'Life' by Lindsey (1862), Lindsey's "Life" in 'The Makers of Canada' (1910); Dent, 'Story of the Upper Canada Rebellion' (1885); Read, 'The Canadian Rebellion of 1837)' (1896).

MACKENZIE, Canada, a district in the Northwest Territories, bounded north by the Arctic Ocean, east by Kcewatin, south by Athabasca, and separated on the west from Yukon by the northernmost spur of the Rocky Mountains The district created in 1895 and administered by the government of the Northwest Territories, is the largest in Canada, having an estimated area of 527,490 square miles, of which 34,265 squares miles are water. The surface generally is diversified; in the northwest it is a sterile waste; along the river valleys and on the western mountain slopes it is well forested with fir, pine, spruce and other northern trees, while coal and other minerals, although unexplotted, are found The principal lakes are Great Slave, Great Bear, Pelly and Clinton Colden. The chief rivers are the Mackenzie, the Coppermine and the Great Fish or Back River. The soil is comparatively unproductive, the climate being arctic and inhospitable except for the few summer months. The population, about 5,400, inhabit the trading settlements of the Hudson's Bay Company's along the Mackenzie and its tributaries. The pelts of the furbearing animals of the region are practically the only developed item of commerce.

MACKENZIE RIVER, Canada, a large river in the Northwest Territories, which flows from the Great Slave Lake, and after a northwesterly course of about 1,000 miles enters the Arctic Ocean by numerous mouths at the island-studded Mackenzie Bay. Its ultimate source is in Thutage Lake, the headwaters of the Finlay in northern British Columbia; its total length from Thutage Lake to the sea is 2,525 miles. Its tributary head-streams are the Great Peace River, which rises in British Columbia beyond the Rocky Mountains, and the Athabasca or Elk River, which has its source in the Rockies; these two rivers flowing into Lake Athabasca are discharged by the Great Slave River into Great Slave Lake whence issues the Mackenzie. The principal affluent of the Mackenzie is the Laird or Mountain River. With the exception of a slight obstruction in the rapids near Fort Good Hope, in lat. 66° N., the Mackenzie and its tributaries are navigable for a distance of over 1,800 miles, and from June to October steamboats of the Hudson's Bay Company ply from Great Slave Lake almost to the Arctic Ocean. Forts Providence, Norman and Good Hope are trading stations along its banks, while Forts McPherson, Franklin, Enterprise, Reliance, Resolution, Chippe-wyan, Nelson and Graham are along its tribu-taries. The valley is well-wooded with spruce, pine, poplar and birch, while coal, salt and other minerals abound in the region. The river is named after Alexander Mackenzie (q.v.), who first explored it in 1789.

MACKEREL, mäk'e-rěl. The common mackerel (Scomber scombrus) is the best-known and most important member of the family Scombride and one of the most valuable of food-fishes, ranking in this respect behind the cod and herrings only. The mackerel is a compactly built fish of smooth and regular outline, the fusiform figure tapeung accurately to the pointed shout, so that it cleaves the water easily. The large, deeply-forked tail is supported on a slender peduncle, provided with two small keels on each side, and preceded by a dorsal and a ventral series of finlets of five each. A soft dorsal and a counterpart anal fin are placed exactly opposite each other and behind the level of the vent, and the anterior dorsal fin is supported by usually 11 delicate Very numerous and small scales cover the body nearly uniformly, but are absent from the head. The large mouth is provided with numerous small sharp teeth. The gill-rakers are long and the air-bladder is wanting. color of the back is deep blue, marked by about 35 nearly vertical wavy black lines; below, the fish is silvery white. A recent close study of the species on the European side of the Atlantic establishes the existence there of local races, as in the herring, but it appears that the American representatives, while constituting a race distinct from the European, are more homogeneous.

The mackerel is an abundant fish on both sides of the north Atlantic, on the American side ranging from Cape Hatteras to the Straits of Belle Isle, and on the European from northern Norway to the Canary Islands and through-out the Mediterranean. While a true pelagic fish of wandering and migratory habits and, like most such, capricious in its movements, the great body of mackerel approaches the American coast and moves along it northward as the temperature of the water rises to about 45° F. On the approach of winter they retire to a greater distance from the land, but a few remain throughout the year near the coast. Mackerel swim in great schools at or near the surface; one such covering an area of 10 square miles, and another estimated as containing 1,000,000 barrels, have been observed. The local movements of the schools are largely regulated by the food-supply, which consists of small pelagic fishes, various kinds of small crustaceans, etc., which are pursued with great eagerness. On the other hand, the bluefish and other carnivorous fishes, porpoises, squids and fish-eating birds, are relentless enemies. and fish-eating birds, are relentless enemies. Spawning takes place in the open sea, not far from the coast from Vineyard Sound to the Gulf of Saint Lawrence, and during the months of May, June and early July. The eggs are about one millimeter in diameter, contain an oil-drop and float at the surface, where the young fish develop and live. They grow rapidly and are about five inches long by the end of the first half year when they are known as the first half year, when they are known as "spikes"; "blinkers" are about one year old and six or seven inches long; "tinkers" are seven to nine inches long and are supposed to be two years old. At the age of three or four

years the mackerel is mature and from 12 to 18 inches long. The very largest specimens weigh about four pounds and have a length of

22 to 23 inches.

The mackerel fishery is of the greatest importance in the New England States and Nova Scotia, and in Norway, Ireland and Great Britain. In Europe the fishery is prosecuted almost exclusively by means of small boats and hand lines, but in America is chiefly carried on in staunch sea-going schooners, most of which hail from Gloucester, Mass, and which are equipped with purse seines, by means of which entire schools are surrounded and captured. The fishing begins off Cape Hatteras in March or April and the schools are followed northward as they appear successively on the New Jersey, New England and Canadian coasts. In addition to the operations of this mackerel fleet, local fisheries are carried on along much of the coast, with pound-nets, gill-nets and hand-lines The spring and local catches are generally sold fresh, the summer catch being split and salted The product of the fishery has been peculiarly subject to fluctuations, due in large part to alternating periods of abundance and scarcity of the fish. Colonial writers refer to its great plenty, and statistics of the catch inspected in Massachusetts show a somewhat regular recurrence of such periods at intervals of about 20 years. From 350,000 barrels in 1880 and 395,000 in 1881, the catch steadily declined to 75,000 in 1886, and 18,000 in 1891, since which

time it has greatly fluctuated.

The total weight of the mackerel landed in Boston and Gloucester in 1929 was 35,744,000 pounds a great increase over the catch of 1928 which was 23,517,000 pounds. Of the 1929 total, 21,264,000 pounds were landed at Boston, and 14,480,000 pounds at Gloucester. In addition there were landed at Portland, Me, in the same year 2,000,000 pounds. The total value of the mackerel landed at all three ports in 1929 was \$1,382,400, compared with a value of \$1,353,900 for the catch of 1928. The output of mackerel fry in 1929 was 2,778,000. The mackerel production of the Canadian provinces in 1928 was 123,768 hundredweight as compared with 158,797 hundredweight in 1927; and 251,478 hundredweight in 1927. The catch of 1928 was valued at \$528,-

267; that of 1922 at \$1,500,357.

An elaborate account of the American mackerel fishery will be found in Brown-Goode's 'Materials for a History of the Mackerel Fishery' (Report of the United States Fish Commission, 1884); for some recent views see Moore, 'Report National Fishery Congress' (Washington 1898); and for methods of preservation, Stevenson, 'The Preservation of Fishery Products for Food' (Bulletin of United States Fish Commission, 1898).

MACKEREL SHARK, or PORBEA-GLE, a shark of the family Lamnida, allied to the man-eater (q.v.), and like it sometimes called blue shark, on account of its color, which is frequently seen on both sides of the northern Atlantic Ocean; it is the Lamna cornubica of ichthyologists. The ordinary length is about 10 feet, and they become very abundant in summer, when the mackerel are running, along the New England coast, and also about Great Britain, where they are called porbeagles. They are a nuisance to fishermen by destroying

their nets, through which several will often tear their way (for they roam about in bands) in pursuit of captured fish. Formerly considerable quantities of oil were saved from their livers, but at present the value of this commodity does not pay for the trouble of taking them.

MACKEY, Albert Gallatin, American writer on Freemasonry: b. Charleston, S. C, 12 March 1807; d. Fortress Monroe, Va, 20 June 1881 He was graduated from the Medical College of South Carolina in 1832 and was demonstrator of anatomy there in 1838, but after 1844 devoted himself to studies of Freemasonry and became a standard authority on the subject. Among his works are 'A Lexicon of Freemasonry' (1845); 'The Mystic Tie' (1849); 'Book of the Chapter' (1858); 'A Manual of the Lodge' (1862); 'A Textbook of Masonic Jurisprudence' (1869); 'Encyclopædia of Freemasonry' (1874).

McKIBBEN, Chambers, American soldier: b. Fittsburgh, Pa., 2 Nov. 1841; d May 1919. He enlisted as a private in the volunteer service 22 Sept. 1862, was brevetted captain for gallant services in the battle of North Anna River (Va.) and in the operations on the Weldon Railway, and on I May 1896 attained the rank of lieutenant-colonel of the 21st United States Infantry. At the beginning of the war with Spain he went to Cuba with Shafter's army, fought at Santiago (1 July 1898), and was made brigadier-general of volunteers and appointed military governor of Santiago. On 12 May 1899 he was mustered out of the volunteer service. Retiring in the same year, he was put in command of the Department of Texas, and two years later was transferred to the command of an infantry regiment. In 1902 he retired with the rank of brigadier-general.

McKIM, Charles Follen, American architect: b. Chester County, Pa., 24 Aug. 1847; d. 14 Sept. 1909. He was son of James Mıller McKim, a Presbyterian minister who was an abolitionist. He studied at the Lawrence Scientific School in 1866, at the Beaux-Arts of Paris in 1867-70, and shortly afterward entered into partnership with Stanford White and William R. Meade This firm achieved some of the finest triumphs of recent American architecture. Among notable examples of its work are the buildings of Columbia University, and the Public Library of Boston. In 1903 McKim received the royal gold medal from the Royal Institute of British Architects in recognition of his services to architecture. He was the second American to obtain this honor, R. M. Hunt (q.v) having been the first. On the occasion of the presentation he made an able speech reviewing the progress of his profession in the United States. He was elected president of the American Institute of Architects.

McKIM, James Miller, American abolitionist: b. near Carlisle, Pa., 14 Nov. 1810; d. Llewellyn Park, West Orange, N J., 13 June 1874. He was graduated from Dickinson College (Carlisle, Pa.) in 1828, studied medicine at the University of Pennsylvania and theology at Princeton (1831) and Andover (1832), and in 1835 was ordained a Presbyterian pastor in Womelsdorf, Pa. An original member of the American Anti-Slavery Society, he became its

lecturing agent in October 1836, and spoke throughout Pennsylvania, often at great personal danger. In 1840 he removed to Philadelphia, where he was publishing agent of the Pennsylvania Anti-Slavery Society and later corresponding secretary until 1862. In November 1862 he called a public meeting in Philadelphia to provide for 10,000 slaves suddenly liberated by the capture of Port Royal, S. C. As a result, the Philadelphia Port Royal Relief Committee was formed. This committee was expanded in November 1863 into the Pennsylvania Freedman's Relief Association, of which McKim became the corresponding secretary. In that capacity he was active in the establishment of negro schools in the South. In 1865-69 he was corresponding secretary of the American Freedman's Commission, which on his motion was disbanded in July 1869. In 1865 he assisted in founding and became a proprietor of the New York weekly Nation During the Civil War he was an advocate of the enlistment of negro troops, and as a member of the Union League of Philadelphia assisted in the recruiting of 11 colored regiments

MACKINAC (mäk'i-näk or mäk'i-nâ) ISLAND, Mich, in Mackinac County, alt., 596 feet, at the entrance to the Straits of Mackinac In Lake Huron It lies 255m. NW. of Detroit. The island is three miles long, and two miles wide It came into prominence when the early missionaries and explorers realized its strategic value. It has steamboat connections with lake ports It has a D A. R. library, a historical museum, and an emergency hospital Among local points of interest are the John Jacob Astor house, old forts, and a "most historic spot of Michigan" monument. The name is a shortened form of the Indian Michilmackmak, meaning "great turtle" Pop. (1930) 566, (1940) 508.

MACKINDER, ma-kin'der, Halford John, English author and educator b Gainsborough, 15 Feb. 1861. He was educated at Christ Church, Oxford; in 1883 was president of the Oxford Union; Burdett-Coutts University scholar 1884; barrister, Inner Temple 1886; reader in geography, Oxford University 1887-1905; and from 1903-08 director of the London School of Economics and Political Science. He was leader of the Mount Kenya Expedition 1899; and was member (Unionist) for the Camlachie division of Glasgow 1910-22. He has served on many important commissions and has written 'The Rhine' (1908); 'Elementary Studies in Geography' (12th ed, 1914); 'Democratic Ideals and Realty' (1919).

McKINLEY, ma-kin'ii, William, American statesman, 24th President of the United States: b. Niles, Trumbull County, Ohio, 29 Jan. 1843; d. Buffalo, N. Y, 14 Sept. 1901 He was educated at Union Seminary, Poland, Mahoning County, Ohio, and Alleghany College, Meadville, Pa. (1860-61). Forced by illness to discontinue his college course, he taught in the public schools, was a clerk in the Poland post-office and on 11 June 1861 enlisted for the Civil War as a private in Company E of the 23d Ohio Volunteer Infantry. His first battle was that of Carnifex Ferry (10 Sept 1861), and on 15 April 1862, while in camp at Fayette-ville, western Virginia, he was promoted commissary sergeant. For conspicuous service at Antietam (17 Sept. 1862) he was made second

lieutenant of Company D His subsequent appointments were, first lieutenant, Company E (7 Feb 1863); capiain Company G (25 July 1864); and brevet major (14 March 1865) When mustered out on 26 July 1865 he was acting assistant adjutant-general on the staff of Gen, S C Carroll, commanding the veteran reserve corps stationed at Washington Among other actions in which he participated were those of South Mountain (14 Sept 1862), Lexington (10 June 1864), Kernstown (24 July 1864), Opequan Creek (Winchester, 19 Sept. 1864), Fisher's Hill (22 Sept 1864) and Cedar Cieck (19 Oct 1864). During his subsequent political career he was generally known, especially in Ohio, as Major McKinley. At the close of the war he began the study of law at Youngstown, Ohio (1865-66), continued it at the Albany (N Y.) Law School (1866-67), in March 1867 was admitted to the bar at Warren, Trumbull County, Ohio, and at once entered practice at Canton. In 1870-71 he was prosecuting at Canton. In 1870-71 he was prosecuting attorney of Stark County, and during the campaign between R. B. Hayes and William Allen for the governoiship of the State, spoke effectively against the "greenback" craze. He was elected to Congress as Republican representative from the 17th Ohio district in 1877, and served continually in the 45th, 46th and 47th Congresses (1877-83). It was asserted by the Republicans that he was elected in 1882 to the 48th Congress by a majority of eight ballots; but, although he had received the certificate of election, his seat was successfully contested by J H Wallace, who was not, however, scated until June 1884. He represented the 20th district in the 49th Congress (1885-87), and the 18th in the 50th and 51st Congresses; but in 1890 was defeated in the 16th for the 52d Congress by 300 ballots by J. G. Warwick, Democrat, heutenant-governor of the State a short crat, heutenant-governor of the State a short time previously. His defeat was attributed to the gerrymandering of the district by a Democratic legislature. His service in Congress was notable. In 1877 he was appointed a member of the Judiciary Committee, and in December 1880 of the Ways and Means Committee to succeed James A. Garfield; and in 1881 was chairman of the committee in charge of the Garfield memorial exercises in the House. In 1889-90 he was chairman of the Ways and 1889-90 he was chairman of the Ways and Means Committee. He was a candidate for speaker of the 51st Congress, but was defeated by T B Reed on the third ballot in the Republican caucus He was known among the foremost orators of the House; and his speeches on arbitration as a solution of labor troubles (2 April 1886) and in support of the civil service laws (24 April 1890) were most favorably received But his principal efforts were made in connection with the tariff, which, from his first appearance in the House, was the chief object of his study. On 6 April 1882 he spoke in advocacy of protection; on 30 April 1884 in opposition to the Morrison tariff bill, making what was esteemed the ablest argument against that measure; and on 7 May 1890 in support of the general tariff bill, now known by his name, which, as chairman of the Ways and Means Committee, he had introduced before the House on 16 April The bill was passed by the House on 21 May, by the Senate on 11 September, and on 6 October became a law. His bill obtained for him an international reputation, and

eventually the Presidency In 1884 he was delegate-at-large from Ohio to the Republican National Convention at Chicago, where he supported Blaine's candidacy, and where, as chairman of the committee on resolutions, he helped to determine the platform of his party, which he read before the convention. In the Republican National Convention at Chicago in 1888, he was again a delegate and chairman of the committee on resolutions H: supported the candidacy of John Sherman, although, when it was finally learned that Blaine would decline the nomination, he was himself the choice of many delegates and was strongly urged to permit the use of his name. At the Minneapolis convention of 1892 he was once more a delegate and was elected permanent chairman of the assembly. He supported the renomination of President Harrison, and though refusing the use of his own name, received the ballots of 182 dele-He then left the chair and moved to make Harrison's nomination unanimous, which was accordingly done In the ensuing campaign was accordingly done in the ensuing campaign he took a very active part, traveling, it was estimated, more than 16,000 miles and speaking to more than 2,000,000 voters. In 1892–96 he was governor of Ohio, having been elected in 1891 by 21,500 plurality, and in 1893 by the unusual plurality of 80,995. Labor riots occurred decreases the description reconstitution reconstitution and the second riots of the property of the propert curred during his administration, necessitating the placing of 3,000 militia troops in active service, but the difficulties were successfully adjusted McKinley also personally directed the relief work for the starving miners of the Hocking Valley district. He was nominated for the Presidency by the Republican National Convention which met at Saint Louis 16 June 1896, and was elected by a plurality of 601,854 over W. J. Bryan, receiving a popular vote of 7,104,779, and in the electoral college a vote of 271 to 176 for Bryan Throughout the campaign he remained in Canton, where he made over 300 speeches to more than 750,000 visitors. Under his administration decided increase in business prosperity followed the passage of the Dingley tariff measure The most important event of his term was the Spanish-American War (qv), which he had believed might be prevented and had done all in his power to avert. When hostilities broke out on the part of certain inhabitants of the Philippine Islands, the President appointed a commission to study the situation and report on the most suitable mode of government for the new territory. On 7 July 1898 he approved the joint resolution of Congress for the annexation of the Hawaiian Islands, and in 1898 he also selected a delegation to represent the United States in The Hague peace conference which convened in May 1899 The original Philippine commission having rendered a report (31 Jan. 1900), the President appointed a new commission, known from its head, Judge W H Taft, as the Taft commission, under whose direction civil government was instituted in the islands on 1 Sept 1900. (See Philippines. History). In 1900 the President stood conspicuously for justice in the settlement of the difficulties in China which marked that summer He was renominated for the Presidency by the Republican National Convention which met at Philadelphia on 25 June 1900, receiving the entire vote of the 930 delegates He was elected by a popular vote of 7,206,677 to 6,374,397 for W. J. Bryan, receiving

till then, the largest popular majority ever given a candidate for the Presidency. He obtained 292 electoral votes and carried 28 States On 5 Sept 1901 he delivered at the Pan-American Exposition, Buffalo, N Y, an important address, summarizing at once the problems then before the nation and his policy for their solution. On 6 September, while holding a reception in the Music Hall of the Exposition, he was twice shot by Leon Czolgosz (qv), an anarchist. He died on 14 September; and 19 September was appointed by his successor, President Roosevelt, a day of mourning and prayer throughout the United States Unprecedented honors were paid to McKinley's memory in foreign capitals, notably in London, where memorial services were held in Westmunster Abbey and Saint Paul's Cathedral A statue was erected in his honor at Columbus, Ohio, and unveiled in 1906 Consult Smith (editor), 'Speeches and Addresses of William McKinley' (1893); Porter, 'The Life of Major McKinley' (1896), and 'Speeches and Addresses of William McKinley from 1897 to 1901' (1900) See also United States, History.

McKINLEY, Mount, United States, a peak of the Rocky Mountains, the highest in North America, south of the central part of Alaska, about 155 miles north of Cook Inlet. The Indian name for this peak is Traleyka and the Russian name, Bolshaya The fact that this is the highest land on the continent was not known till 1896 when Mr. Dickey explored the Sushitna River and the land near its source He estimated the height of the peak at 20,000 feet, and named it McKinley, in honor of William McKinley (qv.) In 1903 it was visited by members of the United States Geological Survey The mountain is a great dome-shaped mass, 20,300 feet above the sea. Consult Balch, E S, 'Mount McKinley and Mountain Climbers' Proofs' (Philadelphia 1914); Browne, A, 'The Conquest of Mount McKinley' (New York 1914).

McKINLEY ACT, a name popularly given to a tariff bill reported to Congress, 21 May 1890, by the Ways and Means Committee of the House of Representatives, of which William McKinley was chairman. It became a law in October 1890 and was repealed in 1894. It increased the duties on wool, woolen manufactures, on tin-plate, barley and some other agricultural products and remitted the duty on raw sugar. The reciprocity feature was an important part of the bill, providing for the remission of duty on certain products from those countries which should remove duties on American imported products. See Tariff

McKINNEY, Mrs. Glen Ford. See Webster, Jean.

McKINNEY, ma-kĭn'ī, Texas, city and Collin County seat, alt. 612 feet, on the Southern Pacific; Louisiana and Arkansas; and Texas Electric railroads, 33m. N. of Dallas, and on state and federal highways. In a rich agricultural area, it has extensive dairying industries. McKinney's principal industries are textile milling, flour milling, and cotton compressing. There is a city library, a general hospital, and a municipal pool and playground. The place was named for, and has a monument to, Collin McKinney, a signer of the Texas declaration of

independence. Near the city is the Collin McKinney home, built in 1832. It has a commission government. The water system is municipally owned. Pop. (1930) 7,307; (1940) 8,555.

MACKINTOSH, māk'in-tōsh, Sir James, Scottish historian and philosophical writer: b Aldourie, Inverness-shire, 24 Oct. 1765; d. London, 30 May 1832. He was educated at Aberdeen and Edinburgh; studied medicine and took the MD. degree in 1787; published his 'Vindiciæ Gallicæ' in answer to Burke's 'Reflections on the French Revolution'; quitted the medical profession and was called to the English bar in 1795. By reason of his brilliant lectures on the 'Laws of Nature and Nations,' and his defense of Peltier, who was prosecuted for a libel on Napoleon Bonaparte, he acquired fame at the bar, and in 1804 was appointed recorder of Bombay and received the honor of knighthood. After an honorable career in India he returned to England, entered Parliament for Nairn and afterward for Knares-borough; was professor of law at Haileybury College (1818-24), a member of Privy Council and in 1830 commissioner of the Board of Control. Among his writings may be mentioned his 'History of England,' a fragment extending only to the reign of Elizabeth; 'Dissertation on the Progress of Ethical Philosophy' in the Encyclopædia Britannica; a 'Life of Sir Thomas More' in Lardner's 'Cyclopædia,' and nine chapters of an unfinished work on the Revolution of 1688.

MACKINTOSH, a water-proof overcoat, or outer garment, one of the products of modern rubber manufacture. It derives its name from the inventor, Charles Mackintosh of Manchester (1766-1843) See Rubber.

MACKLIN, măk'lin, Charles, Irish actor and dramatist: b. Ireland, 1 May 1697; d. London, 11 July 1797. He was the son of an Irish gentleman named McLaughlin and in 1733 appeared in minor parts at Drury Lane, London. He steadily rose in public favor, till 1741 he appeared in his greatest rôle, Shylock. He was accounted from this period among the best actors of the time. His last performance was at Covent Garden in May 1789, at past the age of 90. In 1735 he accidentally killed a brother actor in a quarrel and was tried for murder, and was frequently afterward engaged in disputes and actions at law. Of his own plays only 'The Trueborn Irishman'; 'Love a-la-Mode' (1759), and 'The Man of the World' (1781) have been printed. Consult 'Life' by Parry (1891).

MACKUBIN, mak-kūb'in, Florence, American artist: b. Florence, Italy, 19 May 1861: d. 7 Feb. 1918. She was of American parentage, and studied under Louis Deschamps and Julius Rolshoven in Paris and Herterrich in Munich, also miniature painting under Mile. J. Devina in Paris. Since completing her studies she has lived chiefly at Baltimore, Md. She has specialized in portrait and miniature painting, and her work was exhibited at the Columbian Exposition, 1893; the Tennessee Exposition in 1897; at Paris, 1900; at Buffalo, 1901; Charleston, 1902, and Saint Louis, 1904. She was officially commissioned to execute various portraits for the Executive Mansion and State House, Maryland, among them a copy of Van

Dyck's portrait of Queen Henrietta Maria, and portraits of Governors Calvert and Eden of Maryland Among other portraits are those of Sir Charles Druly at the Admiralty House, Chatham, England, and Sir William Van Horne, Canada. Her miniatures won a medal at the Tennessee Exposition. Among them is one of Cardinal Gibbons.

McLACHLAN, măk-lak'lăn, Alexander, Scottish Canadian poet b. Johnstone, Renfrewshire, Scotland, 12 Aug. 1818; d Orangeville, Ontario, 20 March 1896. He removed to Canada in 1841, was Canadian immigration agent to Scotland in 1862, and in 1874 delivered in Scotland a series of lectures on Canadian life. He lectured also in Canada and the United States. He was a man of broad and democratic sympathies and was deeply interested in the betterment of conditions among the working classes. Author of 'Poems, Chiefly in the Scottish Dialect' (1855); 'Lyrics' (1858); 'The Emigrant and Other Poems' (1861); 'Poems and Songs' (1874).

MACLAGAN, William Dalrymple, English archbishop: b Edinburgh, 18 June 1826; d. 19 Sept. 1910. He was educated at Edinburgh and was graduated in mathematical honors at Cambridge University. He served in the Indian army (1847–49); was ordained deacon (1856) and priest (1857). He was appointed bishop of Lichfield (1878) and archbishop of York in 1891. He published 'Pastoral Letters and Synodal Charges' (1892).

McLANE, măk-lān', Allan, American soldier and jurist: b 8 Aug. 1746; d. Wilmington, Del, 22 May 1829. In 1774 he settled in Kent County, Del, and in the Revolution he took a prominent part. He became a licutenant in Thomas Rodney's regiment of Delaware militia, where he rendered important service at Long Island and White Plains and also in the New Jersey campaign. In 1777 he was made captain and was in command of the American guard about Philadelphia, taking active part in the battle of Monmouth. With the rank of major under Gen. Henry Lee he participated in the capture of Stony Point and Paulus Hook and attained colonel's rank. At the close of the war he was appointed judge of the Delaware Court of Appeals In 1790–98 he was United States marshal of Delaware under Washington's appointment, and from 1808 until his death collector of Wilmington (Del) port. He also served in the Delaware legislature, being for a time speaker of the lower house.

McLANE, James Woods, American physician: b. New York, 19 Aug. 1839; d. 25 Nov. 1912 He was graduated at Yale University in 1861 and took his M.D. at the College of Physicians and Surgeons, Columbia, in 1864. He was thereafter for many years connected with the medical faculty of the College of Physicians and Surgeons, as lecturer on materia medica in 1866-67, professor of materia medica and therapeutics 1868-72, adjunct-professor of obstetrics, diseases of women and children and medical jurisprudence in 1872-79, professor of gynecology in 1882-85 and of obstetrics in 1891-98. He became professor emeritus in 1898; and in 1891-1903 he was dean of the medical faculty. From 1905 until his death he was president of Roosevelt Hospital

McLane, Louis, American statesman: b. Smyrna, Kent County, Del, 28 May 1786; d Baltimore, 7 Oct. 1857. He was the son of Allan McLane (q.v.), and entering the navy at an early age, served as a midshipman under the elder Decatur. Quitting the navy in 1801 he studied law, was admitted to the bar in 1808 and rose to eminence in the profession He represented Delaware in Congress, 1816-27, when he was chosen United States senator. In 1829-31 he was Minister to Great Britain, and on his return home was made Secretary of the Treasury. In 1833 he declined to sanction the removal of the deposits from the United States Bank, and was consequently transferred by the President to the State Department. He held the office of Secretary of State till June 1834, when he resigned and retired from political life In 1837 he accepted the presidency of the Baltimore and Ohio Railroad, which he held till 1847. In June 1845 he was appointed by President Polk ambassador to London during the Oregon negotiations, after the settlement of which he resigned. In 1850 he was a member of the convention to reform the constitution of Maryland.

McLANE, Robert Milligan, American politician and diplomat: b. Wilmington, Del, 23 June 1815; d. Paris, France, 16 April 1898. He studied at the Collège Bourbon of Paris (1829-31), was graduated from West Point in 1837, took active part in the Seminole War in Florida (1837), and served under General Scott in the Cherokee country (Georgia). He resigned from the army in 1843, and having already been admitted to the bar in the District of Columbia, began practice at Baltimore, Md. In 1847-51 he was a Democratic member of the House of Representatives in the 30th and 31st Congresses. In 1853 he was appointed commissioner, with powers of minister plenipotentiary, to China, Japan, Siam, Korea and Cochin China: and from this mission he returned in 1856, having with Commodore Perry concluded important treaties. In 1859-61 he was Minister to Mexico, in which capacity he signed the treaty of 1860. In 1861 he returned to Baltimore and there took a prominent part in the discussions attending the secession of the Cotton He was one of the committee appointed by the Maryland legislature (May 1861) to confer with Lincoln in regard to alleged unconstitutional proceedings on the part of the Federal government within the State of Maryland. Upon the decision of the State legislature, based on the committee's report, that it was inexpedient for Maryland to secede, McLane retired from public affairs for a time. In 1877-78 he was State senator; in 1879-83 a representative in the 46th and 47th Congresses; and in 1883-85 governor of Maryland. He was Minister to France in 1885-89 by appointment of President Cleveland. After tendering his resignation in 1889, he spent his remaining years at Paris.

MACLAREN, ma-klăr'en, Ian. See Watson, John.

McLAREN, William Edward, American bishop: b. Geneva, Ontario County, N. Y., 15 Dec 1831; d. New York, 19 Feb. 1905. He was graduated at Jefferson College, 1851, ordained to the Presbyterian ministry, 1860, and entered that of the Protestant Episcopal Church in 1872. Three years later he was appointed

bishop of Illinois; after the subsequent division of the diocese became bishop of Chicago. He founded the Western Theological Seminary at Chicago (1883) and the Waterman Hall for Girls at Sycamore, Ill Among his writings may be mentioned 'Catholic Dogma the Antidote of Doubt' (1884); 'Analysis of Pantheism' (1885): 'The Holy Priest' (1889); 'The Essence of Prayer' (1901).

McLAUGHLIN, măk-lâk'lin, Andrew Cunningham, American historical writer: b. Beardstown, Ill, 14 Feb 1861. He was graduated from the University of Michigan in 1882, from its law school in 1885, was professor of history there 1891–1906 and since 1906 at the University of Chicago. He was director of the bureau of historical research of Carnegie Institution, Washington, D. C., 1903–05, and managing editor of the American Historical Review, 1901–05 He has written 'Lewis Cass' (in 'American Statesman' series 1891); 'History of Higher Education in Michigan'; 'History of the American Nation' (1899); 'The Confederation and the Constitution' (1905); (with Van Tyne) 'History of United States for Schools' (1911); 'The Courts, The Constitution and Parties' (1912); 'Steps in the Development of American Democracy'; and edited 'The Cyclopædia of American Government' (1914).

McLAUGHLIN, Mary Louise, American artist: b Cincinnati. She began to decorate pottery in 1877 and made Losanti porcelain (1898), exhibiting for the first time in the Paris Exposition of 1900. She has been awarded several public honors for her work. Among her published writings are 'China Painting'; 'Pottery Decoration'; 'Painting in Oil'; 'The Second Madame'; 'An Epitome of History' (1923).

MACLAURIN, măk-lâ'rīn, Colin, Scottish mathematician and philosopher: b. Kilmodan, Argyleshire, February 1698; d. 14 June 1746 He was educated at Glasgow University. and in 1717 became professor of mathematics in Marischal College, Aberdeen, and two years after was chosen Fellow of the Royal Society. In 1720 he published 'Geometrica Organica,' a work on curves. In 1725 he was elected professor of mathematics at Edinburgh, where his lectures contributed much to raise the character of that university as a school of science. A controversy with Bishop Berkeley led to the publication of Maclaurin's great 'Treatise on Fluxions' (1742). He also wrote a 'Treatise on Algebra'; 'Account of Sir Isaac Newton's Philosophical Discoveries,' etc.

MACLAURIN, Richard Cockburn, American educator; b. Lindean, Scotland, 5 June 1870; d. Boston, Mass., 15 Jan. 1920. He took his M.A. at the University of Cambridge in 1897, was elected a Fellow at Saint John's College, Cambridge, in 1897 and was professor of mathematics there in 1898-1905. He was dean of the faculty of law at the New Zealand University in 1905-07; and in 1907-09 he was professor of mathematics at Columbia University, New York. After 1909 he was president of the Massachusetts Institute of Technology. He wrote 'Title to Realty'; 'Theory of Light'; 'Lectures on Light.'

McLAWS, măk-lâz', Lafayette, American military officer: b. Augusta, Ga., 15 Jan. 1821; d. Savannah, Ga., 24 July 1897. He was gradtated at West Point in 1842; served in the Mexican War till the surrender of Vera Cruz; and at the beginning of the Civil War was ommissioned a brigadier-general in the Conederate army. He was promoted major-general 23 May 1862, and during the march of Sherman to the sea commanded the defenses of Savannah and had charge of the military disrict of Georgia He was appointed collector of internal revenue at Savannah in 1875 and Dostmaster there in 1876

MACLAY, ma-kla', Edgar Stanton, Amercan author. b. Foochow, China, 18 April 1863 He was graduated at Syracuse University in 1885; was reporter on the Brooklyn Times, 1886-90, and on the New York Tribune 1891-33; served on the editorial staff of the Tribune, 1893-95, and on that of the New York Sun, 1895-96. In 1896 he was appointed lighthouse-keeper at Old Field Point, and in 1901 received an appointment at the New York navy yard. He edited the 'Journal' of William Maclay (q.v), and was the author of a 'History of the United States Navy,' which occasioned much controversy and brought about his dismissal from government employ, by order of President Roosevelt, in 1901. The ground of this action, following Maclay's refusal of an official request for his resignation, was a passage in the 'History' stigmatizing Read-Admiral Schley as a "caitiff, poltroon and coward" for his conduct in the naval fight off Santiago, Cuba, 3 July 1898. Maclay also wrote 'Reminiscences of the Old Navy' and 'The History of American Privateers' He died 2 Isp 1010

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MACLAY, Robert Samuel, American Methodist Episcopal clergyman: b Concord, Franklin County, Pa, 7 Feb. 1824; d. 1907. He was graduated at Dickinson College in 1845 and entered the Methodist ministry in 1846. He sailed as a missionary to Foochow, China, 13 Oct 1847. He was a member of the committee which translated the New Testament into the Foochow dialect; and in 1852-72 he was superintendent and treasurer of the Foochow Mission. He was transferred to Japan in 1872, becoming secretary and treasurer of the mission there; and assisted in translating the New Testament into Japanese He was a delegate from Japan to the Ecumenical Methodist Conference at London in 1881. He was one of the founders of the Anglo-Chinese College at Foochow in 1881; and in 1884 he secured from the king of Korea permission to establish Christian missions in that country. He was instrumental in founding at Tokio in 1883 the Anglo-Japanese College, of which he was president in 1883-87; and the Philander Smith Biblical Institute in 1884, serving as dean in 1884 the Among the Chinese' (1861); coauthor with Rev. C. C. Baldwin 'Dictionary of the Chinese Language in the Dialect of Foochow' (1871).

MACLAY, William, American soldier and politician: b. New Garden, Chester County, Pa, 1737; d. 1804. He was educated in his native place; was a lieutenant in the French and Indian War, taking part in the expedition against Fort Duquesne in 1758 and afterward serving under General Bouquet. He studied law, was admitted to the bar, went to England

on behalf of militia officers serving in the French and Indian Wai, to confer upon their claims for land-grants with the proprietors of Pennsylvania, and on his return became attorney to the Penn family. In the Revolution he raised troops and equipped them, was assistant commissary of purchase and performed some field service. In 1781 he was elected to the Pennsylvania assembly, afterward held other offices in the State, and with Robert Morris (qv) was elected to the United States Senate, Pennsylvania's first representatives in that body. His service there ended in 1791, but in the Senate he had shown deepseated hostility to Washington and his administration, which was the chief distinction of Maclay's senatorial career. In his later years he was a member of the Pennsylvania legislature and his last public office was that of a county judge. Consult his Journal,' edited by Edgar Stanton Maclay (qv)

MACLE, măl'l, in mineralogy, a variety or andalusite, occurring in long, tapering crystals in clay-slate. They have the axes and angles of a different color from the rest of the crystals, owing to a regular arrangement of impurities in the interior.

MacLEAN, George Edwin, American educator: b. Rockville, Conn., 31 Aug. 1850; d. 3 May 1938. He was graduated at Williams College in 1871 and at Yale Theological Seminary in 1874; from 1877 to 1881 was pastor at Troy, N. Y.; studied in Germany; and in 1883 became professor of English language and Interature at the University of Minnesota He was chancellor of the University of Nebraska, 1895-99, and from 1899 to 1911 was president of the University of Iowa. In 1913 he was sent by the United States Bureau of Education to make a study of the English universities and colleges. His writings include (A Chart of English Literature) (1892); 'Old and Middle English Reader' (1893); and 'A Decade of Development in American State Universities' (1898); 'Present Standards of Higher Education in the United States' (1913); 'Studies in Higher Education in England and Scotland, with Suggestions for Universities and Colleges in the United States' (1916); 'The New International Era' (1923). He edited 'Ælfric's Anglo-Saxon Version of Alguini Interrogationes Sigewulfi Presbyteri in Genesin' (1883); 'An Introductory Course in Old English,' by Wilkin and Babcock (1888) and 'An Old and Middle English Reader,' by Zupitza (1890)

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McLEAN, George Payne, American lawyer and politician: b. Simsbury, Conn., 7 Oct. 1857. He was for a time a reporter on the Hartford Evening Post, then studied law, and was admitted to the bar in 1881, and immediately commenced practice in Hartford. In 1883-84 he was a member of the general assembly, where he soon became distinguished for facility in debate and was considered one of the leaders of the Republican party. In 1888 he was elected State senator and in 1900 nominated by his party as governor of Connecticut and elected. Though he was not widely known at the time of his election, his independent position in regard to constitutional reform soon made him prominent; both in his first governor's message and before the constitutional convention, he advocated representation in the

legislature according to population instead of, by towns. Though in this he opposed certain elements in his own party, he gained support from a considerable number of Democrats and great personal popularity in the cities In 1902 he was offered renomination, but declined; in 1903-04 he was a prominent candidate for United States senator. He was elected to the United States Senate in January 1911 and took office on March 4 following He was re-elected in 1917 and 1923. He was the author of the "Federal Migratory Bird Bill," which became a law on March 4, 1913. He died June 6, 1932

MacLEAN, James Alexander, Canadian educator: b Mayfair, Ontario, Aug 2, 1868 He was graduated at the University of Toronto in 1892 and took his A M. at Columbia in 1893. He was professor of political science at the University of Colorado in 1894–1900; president of the University of Idaho in 1900–13; and from 1913 to 1934 was president of the University of Manitoba, Canada. Author of essays in The Financial History of Canada (1894). He died in London, Eng Jan. 18, 1945.

MacLEAN, John, American jurist and statesman b Morris County, N.J., March 11, 1785; d. April 4, 1861. He removed with his parents to Warren County, Ohio, in 1799, later went to Cincinnati, where he studied law, and was admitted to the bar in 1807, and commenced practice at Lebanon, Warren County, Ohio He was a member of Congress 1812–16, and from 1816–22 judge of the supreme court of Ohio. In July 1823 he was appointed postmaster general, the Post Office Department being then in a very disordered and inefficient condition Under his administration this branch of the public service was restored to order, and managed with a vigor, method and economy that soon secured an almost unexampled degree of applause and public confidence. In 1829 he became associate justice of the Supreme Court of the United States. In this capacity his charges to grand juries while on circuit are distinguished for ability and eloquence. In the Dred Scott case he dissented from the decision of the court as given by Chief Justice Taney, and expressed the opinion that slavery has its origin merely in power, and is against right and in this country is sustained only by local law

McLEAN, John, American educator b. Princeton, N J., 1800; d. there, 1886. His whole life was spent in Princeton. He was graduated from the college there in 1816, became tutor in the institution in 1818 and was a member of the faculty till 1868, when he resigned the presidency, which he had held from 1854. He published Lecture on a Common School System for New Jersey (1829), which in later years had much influence in the establishment of such a system; History of the College of New Jersey (1877), and The True Relations of the Church and the State to Schools and Colleges (1853).

MACLEAN, John, Canadian Methodist clergyman and author. b. Kılmarnock. Scotland, Oct. 2, 1851. He was educated at Vıctoria University, Cobourg, Ontario, and at the Wesleyan University, Bloomington, Ill. He served as a missionary among the Blood Indians near Macleod, Alberta, in 1880–89, and was pastor at Moose Jaw, Saskatchewan, in 1889–92; later

filing pastorates at Port Arthur; and at Neepawa and Carman, Manitoba In 1902-06 he edited The Wesleyan, and thereafter was stationed at Morden, Manitoba In 1888 he was appointed a member of the Northwestern Board of Education Author of The Indians of Canada (1892); The Destiny of the Human Race, The Hero of the Saskatchewan; Better Lives for Common People; Science and the Bible. D. March 27, 1928.

McLEAN, Norman, British Orientalist: b. Lanark, Scotland, Oct 2, 1865. He was educated at the University of Edinburgh and at Christ College, Cambridge. He was examiner in classics at Edinburgh University in 1891–94; examiner for Oriental Languages Tripos in 1895–96, 1899–1900, 1909–11, and for theological Tripos in 1896–97, 1901–02, 1908–09, 1911–12. He was Fellow, senior tutor, Hebrew lecturer and Master at Christ College, Cambridge, and university lecturer in Aramaic He edited with Rev A E Brooke, a larger Cambridge edition of the Septuagint He was an editor of Ecclesiastical History of Eusebius in Syria (1896).

McLEAN, Sarah Pratt. See Greene, Sarah Pratt McLean.

MacLEISH, Archibald, American poet, librarian, and public official: b Glencoe, Ill May 7, 1892. He received his preliminary education at The Hotchkiss School, Lakeville, Conn., and was graduated from Yale University in 1915. He served in the First World War as a captain of field artillery, and in 1919 was graduated from Harvard Law School. In 1923 he abandoned the law to devote his time to the writing of poetry, developing into one of America's foremost poets. His published works include The Happy Marriage (1924); The Pot of Earth (1925); Nobodaddy (a play, 1925); Streets in the Moon (1926); The Hamlet of A. MacLeish (1928); New Found Land (1930); Conquistador, which won the Pulitzer prize for poetry (1932); Frescoes for Mr. Rockefeller's City (1933); Union Pacific—a Ballet (1934); and Panic (a play, 1935). He also wrote two radio verse dramas, The Fall of the City and Air Raid. On June 7, 1939 he was nominated by President Roosevelt to succeed Dr. Herbert Putnam, retiring Librarian of Congress, and the Senate confirmed his nomination June 29. In December 1944 at the instance of Secretary of State Stettinius he was appointed assistant secretary of state in charge of public and cultural relations He resigned the post August 1945.

McLEMORE'S COVE, Ga., Military Operations at. While there was little fighting in the cove, the operations there in September 1863 were vital to the success of General Rosecrans' campaign for Chattanooga. The failure of General Bragg's excellent combinations immediately increased the difficulty of interposing his army between the Union army and Chattanooga and, in the end, made it impossible.

Lookout Mountain bounds the cove on the west. Following its eastern base from Chattanooga southward, it is 24 miles to Stevens' Gap, over which the Fourteenth corps, General Thomas', which constituted the center of Rosecrans' army, crossed Lookout from the west into the cove. Eight miles beyond is Dougherty's Gap, from which point Pigeon Mountain, run-

ning northeastwardly, forms the eastern boundary of the cove The triangular area thus enclosed is from five to eight miles wide, the mouth opening toward Chattanooga, and contains from 80 to 100 square miles. General Bragg, in evacuating Chattanooga, because of Rosecrans' flank movement, had conducted his army by way of Rossville and Lee and Gordon's Mill and established it behind Pigeon Mountain, from a point near Lee and Gordon's to Lafayette, 13 miles beyond From this position of his army there were four gaps through which roads led into McLemore's Cove. Opposite Lafayette was Dug Gap, to the south of it Blue Bird and to the north Cattlett's and Wrothen's. Dug Gap was directly opposite Stevens' Gap. The Chickamauga Creek rises near Dougherty's Gap and runs northward through the cove

The right of the Union army, A McD. McCook's Twentieth corps, with the cavalry corps, Gen D S Stanley, crossed Lookout at Valley Head, 42 miles south of Chattanooga, and descended south of Dougherty's Gap The left of this army, Crittenden's Twenty-first corps, had crossed the north point of Lookout near Chattanooga and, leaving one brigade in that crty, had advanced to the vicinity of Lee and Gordon's Mill. It there formed the left of the Union army. The centre corps was at Stevens' Gap, 15 miles distant, the right corps about 25 miles beyond that point, with the cavalry still farther south. This separation of Rosecrans' army was made necessary by the fact that there were no roads practicable for wheels crossing Lookout Mountain in closer proximity.

General Bragg was fully informed of the movements, and the isolation of the several Union corps. These movements, which placed each corps beyond supporting distance from either of the others, were immediately rendered still more precarious by reports received from General Sheridan on the extreme right that the enemy was retreating toward Rome, which led General Rosecrans to order pursuit. General Thomas urged active concentrations instead, but was overruled.

General Bragg, from his position behind Pigeon Mountain, commanding the four gaps opening directly upon the advance of the centre across the cove, was in most favorable position for first striking General Thomas with effect, and then turning upon either of the wings before they could attain supporting distance. Had Bragg's orders been promptly and vigorously executed the situation of the Union army would have been critical.

The night of the 9th, Negley's division, forming the Union advance from Stevens' Gap along the road leading through Dug Gap to Lafayette, encountered the enemy in the gap, and later in the night it was ascertained that a strong force was concentrating there

strong force was concentrating there.

General Bragg, in developing his plan, had advanced Hindman's division from the Lafayette side of the mountain, and ordered General Hill to send Cleburne to co-operate. Late at night Hill sent word that Cleburne was sick, the gaps blocked with felled trees and that the movement was therefore, impracticable.

Early the next morning General Buckner from the extreme right was ordered to advance into the cove to support Hindman. This junction was not effected until the afternoon of the 10th. Meantime, Negley had withdrawn his

division from Dug Gap and was manœuvering in defense. Humanan, massa Bragg at Lalay ordered, sent a staff-officer to Bragg at Lalay officer to plan. This officer in defense. Hundman, instead of attacking as reached Bragg at midnight and was at once directed to return and notify Hindman to carry out the orders he had received Cleburne was then in Dug Gap, and had promptly cleared away obstructions. Walker's reserve corps was ordered forward to join Cleburne in the attack, and all impatiently waited for Hindman's guns Bragg had ordered seven divisions to co-operate in this movement against Thomas' three which composed the Union centre. Hindman did not attack until afternoon. At that time Baird's division had arrived from Stevens' Gap to support Negley, and by brilliant movements in retreat, with some sharp fighting by T. R Stanley's and Starkweather's brigades, the two divisions with their trains were withdrawn in perfect order to Bailey's crossroads, a strong strategic position in front of Stevens' Gap, where Brannan's division, which had completed the crossing of Lookout, was within easy supporting distance. Thus Bragg's attempt to crush the Union centre failed. For this failure he held Hill and Hindman responsible.

Bragg then withdrew the forces operating against the Union centre to Lafayette, and at once dispatched Polk's and Walker's corps with orders to attack Crittenden's corps in the vicinity of Lee and Gordon's Mill. This corps at the time was known to Bragg to be divided, with one of its three divisions near Ringgold Polk was urged to attack with the greatest promptness He, however, was led to believe that a general attack on his column was about to be delivered. Instead of carrying out Bragg's orders, he therefore awaited attack and sent for the whole of Buckner's corps as reinforcements This delay enabled Crittenden to unite his forces, cross the Chickamauga, and take a strong position on the bluffs overlooking that stream at Lee and Gordon's. Thus Bragg's attempt to crush the Union left failed, as his movement on the centre had miscarried. For this Polk was held responsible.

Meantime the Union right was withdrawing under orders to join the centre at Stevens' Gap. Rosecrans had early discovered that Bragg, instead of retreating, was concentrated for battle, and that Johnston from Mississippi and Longstreet from Virginia were about to join him. General Rosecrans in his report says: "It then became a matter of life and death to effect the concentration of the army." The flanks of the army were 40 miles apart by the nearest practicable roads, and the centre was obliged to emain near Stevens' Gap until the right corps arrived.

General Bragg's third plan, for which orders were promptly given, was to move his army down the valley of the Chickamauga, cross at the bridges and fords below Lee and Gordon's Mill, sweep up the valley, attack Crittenden, the left of Rosecrans' army drive it back on the centre, and thus, interposing between the Union army and Chattanooga, push it back into the mountains and regain that most important city, Rosecrans, however, by an undiscovered night march moved his centre and right from the cove to the left of Crittenden, and at sunrise of 19 September had interposed between Bragg and Chattanooga on the field of Chickamauga.

These movements of the opposing armies brought on the battle of Chickamauga (q v) H. V. Boynton.

McLENNAN, John Cunningham, Canadian physicist: b Ingersoll, Ontario, 14 April 1867. He was educated at the universities of Toronto and Cambridge From 1899 he was connected with the faculty in physics at Toronto, and after 1907 he served as professor of physics and director of the physical laboratory there. He was president of section III of the Royal Canadian Society in 1910; was elected to the Royal Society, London, in 1915; and in 1916–17 he was president of the Royal Canadian Institute. He was Dominion lecturer on the metric system in 1906, and was author of papers on radioactivity, electrical conduction of gases and spectroscopy D. 9 Oct. 1935.

McLENNAN, măk-lěn'an, John Ferguson, Scottish sociologist b Inverness, 14 Oct 1827; d Hayes Common, Kent, 16 June 1881. He was educated at King's College, Aberdeen, and Trinity College, Cambridge, and after two years spent in journalism in London returned to Edinburgh, and was called to the bar in 1857. His first important publication was the article on 'Law' in the eighth edition of the 'Encyclopædia Britannica' (1857), and in 1865 he elaborated some of its sp. culations in 'Primitive Marriage: an Inquiry into the Origin of the Form of Capture in Marriage Ceremonies' In 1876 his 'Primitive Marriage' was republished with 'Kinship in Ancient Greece' and other matter under the title of 'Studies in Ancient History.' An unfinished work by him, directed against Sir H S Maine's patriarchal theory, was completed and published in 1885 by his brother under the title of 'The Patriarchal Theory' In 1896 a second series of 'Studies in Ancient History,' treating of the origin of exogamy, was edited by his widow and Arthur Platt Though his views are still and probably will remain matter of controversy, the study of primitive society received a powerful impetus from his important investigations.

McLEOD, măk-loud', Alexander, American Presbyterian clergyman: b. Island of Mull, Scotland, 12 June 1774; d. New York, 17 Feb 1833 He came to the United States in 1792 and was graduated at Union College in 1798. He was licensed to preach in 1799 and was ordained in charge of the First Reformed Presbyterian Church of New York and of a church in Wallkill, N. Y. He soon resigned from the Wallkill charge, but retained his New York pastorate the remainder of his life. He was for a time an editor of the Christian Magazine. Author of 'Negro Slavery Unjustifiable' (1802); 'Ecclesiastical Catechism' (1807); 'View of the Late War' (1815); 'The American Christian Expositor' (2 vols, 1832-33), etc.

McLEOD, Archibald Angus, American railway official b. Compton County, Quebec, Canada, 1848; d 1902. Early in life he came to the United States, where he became a rodman on the docks of the Northern Pacific Railway at Duluth, and in 1885 manager of the Elmira, Cortland and Northern line He then was successively acting general manager (1886), vice-president and general manager (1887) and president (1890) of the Reading system. His consolidation of the Lehigh Valley and Jersey

Central with the Reading, under Reading control, for the purpose of controlling the carrying trade of the coal fields, resulted in the Reading passing into the hands of three receivers, of whom McLeod was one.

MacLEOD, Donald, Scottish Presbyterian clergyman and author: b. Campsie, Stirlingshire, 18 March 1831; d 17 Dec. 1911 He was a brother of Norman MacLeod (q v), whom he succeeded as editor of Good Words, 1872–1905. He was educated at the University of Glasgow He held pastorates at Lauder (1858), Linlithgow (1862) and Glasgow (1869–1909), and, like his brother, was chaplain to Queen Victoria He published 'Sunday Home Service' (1885); 'Christ and Modern Society' (1893), etc.

MACLEOD, Fiona, pseudonym of William Sharp (qv.), Scottish poet and novelist: b. Paisley, 12 Sept. 1856; d Sicily, 13 Dec. 1905. A part of his youth was spent in the Hebrides and in the islands of Iona and Arran. His stories and poems attracted great attention by reason of their freshness of treatment and originality of conception. Under his own name he published a number of works, including poems, stories, and biography, beginning with a life of Rossetti in 1882. In 1893 he began writing mystical prose and verse under the pen name of 'Fiona Macleod,' and cleverly concealed his identity, going the length of supplying a fictitious biography of the lady, to 'Who's Who,' and corresponding, through his sister, with her admirers. He also wrote concurrently, under his own name. Among works published as Fiona Macleod are 'Pharais' (1895), a romance; 'The Mountain Lovers' (1895); 'The Sin-Eater and Other Tales' (1895); 'The Washer of the Ford' (1896); 'Green Fire' (1896); 'From the Hills of Dream' (1896); 'The Laughter of Peterkin' (1897); 'Through the Ivory Gate' (1901); 'The Silence of Amor' (1902).

McLEOD, Hugh, American soldier: b New York, 1 Aug. 1814; d. Dumfries, Va, 2 Jan 1862. He was graduated at West Point in 1835 and served on frontier duty at Fort Jesup, La., until June 1836, when he resigned. He then joined the Texans in their struggle against Mexico, and afterward practised law at Galveston, Tex. As brigadier-general of the Texas militia he was appointed by President Mirabeau B. Lamar of Texas to the command of an expedition planned to secure an establishment of trade between Texas and Mexico in 1841, but was taken prisoner by the Mexicans and not released until the following year, when the United States government intervened in his behalf. He served in the Texas Congress in 1842-43, fought through the Mexican War and was a member of the State legislature after the annexation to the United States. He joined the Confederate army in 1861 and served on the Rio Grande and in the first Virginia campaign.

McLEOD, John, Canadian pioneer: b. Stornaway, Island of Lewis, Scotland, 1788; d. Montreal, 24 July 1849. He was engaged in the service of the Hudson Bay Company in 1811, mustering men for the company's service in the Hebrides and conducting them to Canada. In 1812–16 he built the trading posts of the company for 500 miles westward of the Red River

establishment. He was the first man known to have traversed the continent from Hudson Bay to the Pacific coast. He was in charge of Norway House, the most important fur-trading establishment in that part of the country, in 1826–30 He was afterward in charge of the Saint Maurice district, extending from Hudson Bay to the Saint Lawrence He was a man of wide influence among both the whites and the Indians and accomplished an important work in opening the northwest for settlement.

the northwest for settlement.

MACLEOD, John James Rickard, Canadian medical scientist b. Dunkeld, Scotland, 6 Sept. 1876; d. 18 March 1935. He was educated at Aberdeen, Leipzig, and Cambridge unversities and received his Ph D. from the University of Toronto. Regius professor of physiology at the University of Aberdeen at his death, he was Anderson traveling fellow, University of Aberdeen in 1898-99, demonstrated in physiology at London Hospital in 1899-1903, MacKinnon scholar of the Royal Society, 1900-03, professor of physiology at Western University, Cleveland, Olno, from 1903 to 1918, and professor at the University of Toronto from 1918 to 1935 In 1923 he was associate dean of the faculty of medical sciences. He was fellow of the Royal Society of Canada. His published works include: 'Diabetes Its Physiological Pathology'; 'Fundamentals of Physiology and Biochemistry in Modern Medicine', 'Carbohydrate Metabolism and Insulin'; (Insulin'; and various articles in scientific journals.

McLEOD, Malcolm, Canadian lawyer, son of John McLeod (q.v.); b. Green Lake, Saskatchewan, 21 Oct. 1821; d Ottawa, September 1898 He was educated at Edinburgh, Scotland, later studied law in Montreal and in 1845 was admitted to the bar. He engaged in practice, was district judge for the counties of Pontiac and Ottawa in 1873–76 and in 1887 he became Queen's counsel. He was prominently connected with the projects of annexation of the Northwest territory to Canada and the building of a railroad to the Pacific. He was instrumental in securing the revocation of the Hudson Bay Company's charter, taking the matter to the British Colonial Secretary when the Canadian Parliament refused to act. Author of 'The Peace River' (1872); five pamphlets on 'The Pacific Railway' (1874–80).

MACLEOD, Canada, town and capital of Macleod District, Alberta, on Old Man's River, about 100 miles south of Calgary, and on the Canadian Pacific Railway. It is situated in a rich agricultural and coal-mining region, has natural gas, stone quarries, and deposits furnishing materials for the manufacture of cemert and of bricks. It has a considerable trade in grain. The village is growing rapidly and is a post of the Royal North West Mounted Police. Pop. (1936) 1,365.

MACLISE, ma-klēs', Daniel, English painter: b. Cork, 1806; d. Cheyne Walk, Chelsea, 25 April 1870. He became a student at the Royal Academy in 1828, and began to exhibit in 1829, but it was not until 1833 that he established his reputation with his picture of 'Snap Apple Night.' Three years after he was elected an associate, and in 1840 he became a full member of the Royal Academy. Maclise was commissioned to paint for the new Houses of Par-

liament, and produced 'The Spirit of Chivalry'; 'The Spirit of Religion,' and the two great paintings of the 'Meeting of Wellington and Blucher after Waterloo,' and the 'Death of Nelson' (1858-64), for which patriotic paintings he refused all remuneration. Among his best-known pictures are 'Merry Christmas in the Baron's Hall'; 'The Ordeal of Touch'; 'The Marriage of Stronghow and Eva'; the 'Play Scene in Hamlet'; the 'Banquet Scene in Macbeth,' etc His sketches, book illustrations, humorous drawings and outline portrarts were very numerous. He declined the presidency of the Academy in 1866. His works show great fertility of invention, skill an composition and excellence in drawing, but his color is coarse, and his pictures are sometimes disagreeable unless seen from a distance. His mural paintings are now recognized to be the greatest historical paintings of their kind ever produced in England. Consult O'Driscoll, 'Memoir of Daniel Maclise' (1871).

McLOUGHLIN, mak-lök'lin, John, Canadian pioneer and fur trader: b. Rivière du Loup. Lower Canada, 19 Oct. 1784; d Oregon City, 3 Sept 1857. He was educated in Canada and at Edinburgh, Scotland, studied medicine and in early manhood returned to Canada, where he entered the Northwest Company and was placed in charge of Fort Walkam, the chief depot of the company, situated at the mouth of the Kaministiqua River on Lake Superior. Upon the consolidation of the Northwestern and the Hudson Bay companies, in 1821, Dr. McLough-lin was appointed chief factor of the company in the Oregon country. Airiving overland at Astoria in 1824 he founded Fort Vancouver, which, situated advantageously near the confluence of the Columbia and Willamette rivers, became the headquarters of the company beyond the Rockies When Dr McLoughlin established the fort the Indians were so hostile that it was unsafe for parties of less than 60 men to travel the Columbia River, but under his management of the company's affairs it became safe for two men to traverse the distance between Oregon City and Fort Hall. In the entire period of his administration, from 1824 to 1846, there were no Indian wars in the Oregon country, although they broke out in 1847, the year after his resignation He made Fort Vancouver a haven of refuge to emigrants arriving after the perilous journey overland, furnishing goods and provisions on credit and caring for their sick in direct opposition of the company's policy, which was to keep the land wild for the wild furbearing animals. During McLoughlin's administration the Oregon country was in the condition of joint occupancy by the United States and Great Britain His courageous and humanitarian method of dealing with the situation, recognizing the equal rights of the American settlers with those of the British Fur-trading Association, undoubtedly went far toward preventing war between the British and American nations. However, the strictures upon his methods by Sir George Simpson, governor-inchief of the Hudson Bay Company, culminated in an order to render no further aid to immigrants, and McLoughlin resigned rather than obey, although it cost him his income of \$12,000 a year. His resignation took effect in 1846, and he then retired to Oregon City where he had

extensive and partially improved land claims. Litigation over his claims embittered his last years, but after his death the land was restored to his heirs. He became an American citizen in 1848. The McLoughlin Institute was dedicated to his memory at Oregon City in 1907, and he is generally known as the "Father of Oregon." Consult the 'Reports' of the Washington Historical Society, the Oregon Historical Society and the Oregon Pioneer Association; Dye, E. E., 'McLoughlin and Old Oregon' (1900; 8th ed. 1913); Holman, F. V., 'Dr. John McLoughlin, the Father of Oregon' (1907).

McLOUGHLIN, Maurice Evans, American tennis champion b Carson City, Nev, 1890. He won the championship of the Pacific Coast, played in the East in 1908–09 and in 1909 and 1911 he competed for the Davis cup in Australia, but unsuccessfully He won the national championship at Newport in 1912; and in 1913 was leader of the American team that captured the Davis cup from England. He was victor at Longwood and won the New York State championship in 1914. His defeat of Brookes and Wilding in singles made him world champion Author of Tennis as I Play It (1915)

McLOUTH, mak-lowth', Lawrence Amos, American educator and author: b. Ontonagon, Mich., 19 Jan. 1863; d. 1927. He was educated at the universities of Leipzig, Heidelberg and Munich He was instructor in German at the University of Michigan in 1892–95; and after 1895 was professor of Germanic language and literature at New York University. He edited German texts, was author of numerous articles on literature, philology and pedagogy, and of 'Verses' (1910).

MACLURE, măk-lūr', William, American geologist. b Ayr, Scotland, 1763; d. San Angel, near the city of Mexico, 23 March 1840. In 1796 he visited the United States, and in 1803 was in Europe as one of the commissioners to settle the claims of American citizens against France for spoliations during the revolution in that country. On returning to America he engaged with zeal in the extraordinary private undertaking of a geological survey of the whole country. Depending on his own resources and observations at a time when geology was unknown as a science, and few could appreciate his motives, he visited almost every State and Territory, crossing and recrossing the Alleghanies no fewer than 50 times Hus first communication to the public was a memoir entitled 'Obextlain to the public was a memoir entitled 'Observations on the Geology of the United States, explanatory of a Geological Map,' read before the American Philosophical Society, 20 Jan. 1809, and published in Vol. VI of their 'Transactions' He still continued his explorations, and on 16 May 1817 presented another memoir to the society, published in their (Transactions). to the society, published in their 'Transactions,' and also in a separate volume The former publication was six years prior to that of the geological map of England prepared by William Smith, a production which gave him the title of father of English geology. To Maclure is equally due the title of father of American geology. His publications attracted much attention to the science He now settled in Philadelphia and gave his books and collections to the Academy of Natural Sciences of which he was president from 1817 till his death. He lived in Spain, 1819-24 where he attempted to found an

agricultural college, and returning in 1824 to the United States attempted to carry out a similar scheme in the New Harmony settlement in Indiana. Several distinguished naturalists from Philadelphia joined him in this enterprise, but the scheme failed. After 1828 he lived in Mexico, always, however, with the intention of returning to the United States, and with his interest in the progress of scientific education there unabated. While in Mexico he wrote 'Opinions on Various Subjects,' devoted mainly to political economy (1837)

McMAHON, måk-ma'hon, Sir Arthur Henry, British soldier and administrator: b 28 Nov. 1862 He was educated at the Royal Military College at Sandhurst, joined the 8th Regiment in 1883 and in 1885 entered the Indian Staff Corps and joined the 1st Sikhs, Punjab Frontier He became affiliated with the Indian Political Department in 1890 and served as political agent on various missions until 1901, when he became Revenue and Judicial Commissioner at Beluchistan. He was an arbitrator on the boundary between Persia and Afghanistan in Seistan and also served as British Commissioner to the Seistan Mission in 1903–05. He was Foreign Secretary to the Government of India in 1911–14 In 1914–16 he was High Commissioner of Egypt. He was knighted in 1906.

McMAHON, James, American mathematician: b. County Armagh, Ireland, 22 April 1856; d. 1 June 1922. He was graduated at the University of Dublin in 1881. He was examiner in mathematics 1883–84, instructor 1884–90, assistant professor 1890–96, and professor after 1904 at Cornell University. In 1891–97 he was associate editor of Amals of Mathematics. Professor McMahon was joint author of 'Higher Mathematics' (1896); the 'Cornell Mathematical Series,' and 'Plane Geometry' (1903).

MacMAHON, Marie Edme Patrick Maurice de, Duke of Magenta and Marshal of France. b. Sully, Saone et Loire, 13 June 1808; d. near Montargis, 17 Oct. 1893 He was de-scended from an Irish family that went into exile with James II, and was educated at the military college of Saint Cyr; served with distinction in Algeria; became brigadier-general in 1848; received command of a division during the Crimean War, and assisted in storming the Malakoff; was appointed to the Senate in 1856; took part in the campaign of 1859 against Austria, and won the battle of Magenta by his prompt handling of the left wing and was rewarded by a marshal's baton and a dukedom; and in 1864 became governor-general of Algeria. At the outbreak of war between France and Germany (1870) MacMahon was placed in command of the First army corps, which was defeated at Weissenburg and Worth, and finally fell back upon Châlons Here he rallied his forces, and proceeded northeastward to relieve Bazaine, who was besieged in Metz, but he was pursued by the Germans, shut up by them in the town of Sedan and wounded in the battle before the final surrender with 81,000 men. After the armistice with Germany he was employed by the Versailles government in putting down the commune, and in 1873 was elected President of the republic, a position which he occupied until 1879. Consult Daudet, 'Souvenirs de la prési-dence du Maréchal de MacMahon' (Paris 1880); 'Le maréchal de MacMahon' (ib 1883);

LaFarge, 'Histoire complète de MacMahon, maréchal de France, duc de Magenta' (1b 1898).

MacMANUS, măk-man'ŭs, Seumas, Irish novelist and writer of short fiction and verse b. Donegal, 1868 He was educated at a mountain school in Donegal and engaged in teaching He soon became known for his prose and verse contributions to periodicals, dealing with the traditions and folklore of Ireland. He visited America in 1899 and afterward his contributions appeared in many leading American periodicals He has since made frequent lecture tours in America. Author of 'Through the Turf Smoke' (1899), 'Donegal Fairy Tales' (1900); 'Ballads of a Country Boy' (1905); 'The Leadin' Road of Donegal' (1900); 'Irish Nights'; 'Yourself and the Neighbors' (1914); 'Ireland's Case' (1917), etc. Among his plays are 'The Woman of Seven Sorrows'; 'Orange and Green'; 'Rory Wins'; 'Nabby Harren's Matching'; 'Top o' the Mornin',' etc.

McMASTER, John Bach, American historian. b. Brooklyn, 29 June 1852. He was graduated from the College of the City of New York in 1872, studied civil engineering, and 1877 became instructor of civil engineering at Princeton. In 1883 he published the first volume of his 'History of the People of the United States,' and the same year was appointed pro-fessor of American history in the University of Pennsylvania. His 'History,' of which eight volumes were published in 1913, has become a standard work. It covers a period reaching from the close of the Revolution (1783) to the outbreak of the Civil War,—less than 100 years, but a crucial time for the shap-ing of the country The account of the forma-tive time, the day of the pioneer and the settler, engaged his particular attention and received his most careful treatment. He strove to give a picture of social rather than constitutional and political growth; and tells the story of national evolution with admirable lucidity and simplicity of style, and always with an appeal to fact precluding the danger of the subjective writing of cluding the danger of the subjective writing of history to fit a theory. His other works are (Benjamin Franklin as a Man of Letters) (1887); 'With the Fathers, Studies in American History' (1896); 'Origin, Meaning and Application of the Monroe Doctrine' (1897); 'A School History of the United States' (1897); 'A Primary School History of the United States' (1901); 'Daniel Webster' (1902); 'Brief History of the United States' (1903); chapters 9, 11 and 12, Vol. VII, 'Cambridge Modern History' (1903); 'Struggle for the Social, Political and Industrial Rights of Man Social, Political and Industrial Rights of Man in America' (1903); 'The United States in the World War' (1919); 'A History of the People of the United States' (1927). D. 24 May 1932.

McMASTER, William, Canadian senator and philanthropist: b Tyrone, Ireland, 24 Dec. 1811; d. Toronto, Canada, 22 Sept. 1887. When 22 years of age he emigrated to Canada, and after several years' experience in a large wholesale firm in Toronto commenced business on his own account. He was elected a member of the legislative council for the Midland division of Canada in 1862, and held this seat until he was called to the Senate by royal proclamation in 1867. He was prominently identified with many public institutions, notably as president of the Canadian Bank of Commerce, member

of the senate of the University of Toronto chairman of the Canadian board of the Great Western Railway and became widely known by his liberal donations to educational and religious institutions, especially those of the Baptist denomination, of which sect he was a member. McMaster University, Hamilton, is named in his honor.

McMASTER UNIVERSITY, Hamilton, Canada, established in 1887 through the generosity of Senator William McMaster (q.v.) and by a charter from the Legislative Assembly of Ontario, is ultimately controlled through the Baptist Convention of Ontario and Quebec, which elects the members of the board of governors, 16 in number, exclusive of the Chancellor. It occupies a site of over 90 acres, surrounded by extensive parklands at the western limits of Hamilton, but prior to 1930 was situated in Toronto, where its Arts faculty was opened in 1890. At present it has an endowment of \$2,-250,000, owns five main buildings, and has a staff of 42 in two faculties, a library of 50,000 volumes, and an annual attendance of over 600, plus more than 350 part-time evening and summer students. A «Christian school of learning,» the university has no sectarian tests for students, and requires only that instructors be members of an evangelical Christian church. The present unian evangencal Christian Church. The present university grew directly out of the Canadian Literary Institute, established in 1857 by Baptists of central Canada, in Woodstock, Ont., under the principalship of Rev. R. A. Fyle, D.D. This coeducational school was set up by act of Pailiament, and provided literary and theological courses. Arts studies were partially developed through temporary affiliation with the University. courses. Arts studies were partially developed through temporary affiliation with the University of Toronto in 1875, and in 1881 the theological work was transferred to Toronto, where the Toronto Baptist College was established through gifts of Senator McMaster, whose later bequest of \$900,000 made possible the endowment of the new university in 1887. The college in Woodstock, changed into a boys' and young men's preparatory school, remained open until 1926, and preparatory school, remained open until 1926, and preparatory school, remained open until 1926, and a similar school for girls and young women, Moulton College, founded by Mrs. Susan Moulton McMaster in 1888, still operates in Toronto under the supervision of the McMaster Board of Governors. Matters of academic policy, including nominations to the faculty, are in charge of a Senate, which includes the governors and representatives of the faculty and alumni, while the board of governors makes appointments to the board of governors makes appointments to the staff and deals with finances and all questions affecting the corporation. The removal to Hamilton, and consequent enlargement of the McMaster constituency and resources, were made possible through generous gifts from graduates, members of Baptist churches, and interested citizens of Hamilton.

Howard P. Whidden, Chancellor.

MacMECHAN, Archibald McKellar, Canadian scholar and author. b. Berlin (now Kitchener), Ontario, 21 June 1862; d. Halifax, N. S, 7 Aug. 1933. He was educated at the University of Toronto and at Johns Hopkins, and in 1889 was appointed professor of English language and literature at Dalhousie University, Halifax, N. S. He retained this position until shortly before his death. He published: 'The Relation of Hans Sachs to the Decameron';

The Porter of Bagdad; The Life of a Little College; The Winning of Responsible Government, Sagas of the Sea; Headwaters of Canadian Literature; The Book of Ultima Thule; There Go the Ships, Red Snow on Grand Pre; Late Harvest, a volume of poems appeared after his death.

McMECHEN, mäk-měk'ěn, W Va., city in Marshall County, alt 710 feet, on the Ohio River, 6m. S. of Wheeling. It is a residential town, with local industries Near by, at Moundsville, is the Grave Creek Mound, one of the largest in the country, being 79 feet high and 900 feet in circumference. It was settled in 1823, incorporated in 1895, and has a mayor and council Pop (1930) 3,710; (1940) 3,726.

McMICHAEL, William, American soldier and lawyer. b. Philadelphia, Pa, March 4, 1841; d New York City, April 20, 1893. The third son of Morton McMichael, he graduated at the University of Pennsylvania in 1859, but left his law studies in April 1861, to enlist as a private. He attained rapid promotion to the grade of colonel. He resumed his law studies after the war and in 1865 became a member of the Philadelphia bar. During General Grant's first tenure of the presidency he was appointed solicitor of internal revenue of the Treasury Department, but resigned the office in 1871 on his appointment as United States assistant attorney general. In 1877 he was appointed United States district attorney for the east district of Pennsylvania, but resigned shortly after to go into private practice. President Garfield appointed him a member of the United States Board of Indian Commissioners; in 1882 he was a candidate for Congress on the Independent Republican ticket; and later became a member of the bar of New York City. Like his father, he was renowned for his oratorical gifts.

MACMILLAN, a name for many years prominently identified with English publishing interests. Most important was Daniel Macmillan: b. Upper Corrie, Isle of Arran, Sept 13, 1813; d. June 27, 1857. He took service with a Cambridge bookseller in 1833, and with Seeley, Fleet street, London in 1837. He set up in business in London in 1843, but soon removed to Cambridge, and by 1856 had developed a very prosperous trade. He published Hughes' Tom Brown's School Days in 1857; but he was chiefly aided by educational publications, and the works of Kingsley and F. D. Maurice. Associated with him from 1843 was his brother, Alexander Macmillan (b. 1815; d. 1896), previously a school-teacher at Nitshill, not far from Paisley. In 1863 he was made publisher to Oxford University and in the same year removed the business to London. Macmillan's Magazine made its appearance in 1859 and continued publication until 1907. The firm maintains a branch in New York and publishes many university and educational works, as well as considerable fiction, by American authors. Later representatives of the family were Sir Frederick Macmillan: b. 1851; d. June 1, 1936 (eldest son of Daniel Macmillan). He was chairman of Macmillan and Company, Ltd, from 1893, a director of The Macmillan Company, New York, and was president of the Publishers' Association of Great Britain, 1900, 1901, 1911, 1912. George A. Macmillan: b.

1855; d. March 3, 1936 (second son of Alexander Macmillan), was a director of both the English and American establishments of the firm. MAURICE CRAWFORD MACMILLAN. b. 1853; d. March 31, 1936 (second son of Daniel Macmillan) was also a director in both houses of the firm. Consult Hughes, Memorials of Daniel Macmillan (1882), Life and Letters of Alexander Macmillan (1910).

McMILLAN, Sir Daniel Hunter, Canadian administrator: b Whitby, Ontario, January 1846. He was educated in Canada and in 1864 served with the Canadian Volunteers on the Niagara frontier. He afterward took part in the military operations during the Fenian Raid in 1866, the Red River Expedition of 1870; and in the Northwestern Rebellion of 1885 he was awarded a medal He was elected to the Manitoba legislature from Winnipeg in 1880, and became a member of the Manitoba government in 1889. In 1900–11 he was lieutenant governor of Manitoba and Keewatin. He was knighted in 1902, and formerly held the rank of lieutenant colonel in the Manitoba Grenadiers. Died April 14, 1933.

MacMILLAN, Donald Baxter, American explorer and scientist: b. Provincetown, Mass, Nov 10, 1874. He was graduated from Bowdoin College in 1898, and took post graduate courses in anthropology at Harvard. In 1908 he joined the Peary Arctic Expedition, which culminated in 1909 in the discovery of the North Pole. He was a member of the Cabot Labrador Expedition in 1910, and in 1911-12 did ethnological work in that region. MacMillan organized his first independent expedition in 1913. This had for one of its purposes the solution of the problem of Crocker Land, which Peary believed himself to have seen in one of his earlier expeditions. He remained in the Arctic regions until 1917, proving the nonexistence of Crocker Land, and exploring a large part of the hitherto unvisited Grant Land. MacMillan was appointed professor of anthropology at Bowdoin College in 1918, and in that year, and in 1919, served in the aviation branch of the navy. In 1920 he explored in the Hudson Bay region. In the next year he organized and commanded an expedition to Baffin Land, followed in 1923-24 by researches on the glaciers of Kane Sea, and in 1925 by an expedition whose chief purpose was to reach the North Pole by airplane Commander Richard E. Byrd was in charge of the aeronautical part of the expedition. MacMillan visited Labrador and Greenland in 1926, and in 1927, 1929 and later organized expeditions to the North.

MacMILLAN, Sir Ernest Campbell, Canadian composer: b. near Toronto, Aug. 18, 1893. Dean of the faculty of music at the University of Toronto from 1927, principal of the Toronto Conservatory of Music from 1926, and conductor of the Toronto Symphony Orchestra after 1931. Dr. Macmillan was educated at Toronto and Edinburgh. From the age of nine onwards he made public appearances, and at the age of 13 was able to pass the examination for associateship of the Royal College of Music, and at 17 was graduated Mus B. at Oxford. In Germany at the outbreak of the World War of 1914-18 he was interned at Ruhleben and while there wrote a setting of Swinburne's England

which Oxford accepted for the degree of Mus D in 1918. His works include England: an Ode for Chorus and Orchestra; Sketches for String Quartette; Songs; Choral Compositions; Canadian Song Book.

McMILLAN, James William, American soldier: b. Clark County, western Virginia, 1826; d. March 10, 1903. At the time of his death he was a member of the board of review of the Pension Bureau. Brevetted major general in March 1865, he commanded the 1st and 2d brigades of the 19th Army Corps and served with Butler in the Gulf campaign.

MACMILLANITES. See Cameronians; Presbyterianism.

MACMILLEN, Francis, American violinist. b. Marietta, Ohio, Oct 14, 1885. He entered the Chicago College of Music at the age of seven, afterward studying at Berlin, Brussels and Saint Petersburg, under Joachim, César Thomson, Flesh, Auer and others. He received first prize and the Van Hal cash prize at the Brussels Royal Conservatory when 16 years of age. He made his first public appearance in Brussels in 1903, afterward touring England, Belgium, France and Germany He made his American debut at Carnegie Hall Dec. 7, 1906, and made concert tours of the principal cities of the United States.

McMINNVILLE, māk-mīn'vīl, Oreg., city and Yamhill County seat; alt 154 feet; on the Yamhill River; 38m SW. of Portland. It is the trade center of a dairying, and fruit and nut raising area. Lumber, condensed milk, brick and tile, and gloves are manufactured. Linfield College, Baptist and coeducational is located here. W. T Newby, a miller from McMinnville, Tenn., settled here in 1844 and named the town, Pop. (1940) 3,706.

McMINNVILLE, Tenn., town and Warren County seat, alt. 1,000 feet, 103m. by rail E. of Nashville The region is agricultural, with some mineral and timber areas. The town has varied industries, producing tool handles, blankets, hosiery, and overalls. Settled about 1800, it was incorporated as a village in 1809, as a town in 1872. It has a mayor and council Pop. (1930) 3,914; (1940) 4,649.

MACMONNIES, māk-mūn'īz, Frederick William, American sculptor: b. Brooklyn, N Y, Sept. 20, 1863 In his 17th year he became pupil and assistant to Augustus Saint Gaudens, and going to Europe in 1884 he studied at Munich, and later was admitted to the studio of Falguière at the École des Beaux-Arts, and also studied with Antonin Mercie; in 1887 opened a studio of his own in Paris. In' 1889 his statue of Diana was honorably mentioned in the Salon, and his Nathan Hale in City Hall Park, New York, and James S. T. Stranahan in Prospect Park, Brooklyn, were much admired in the Salon 1891. His Bacchante (Salon 1894) was purchased for the Luxembourg. He was prolific in the creations of the chisel, and his work is to be seen in Washington Memorial Arch, New York City, in the statues of Prospect Park, Brooklyn, and the Battle Monument at West Point. He executed a number of statues for the Columbian Exposition in the Court of Honor (Chicago 1893). After 1900 he devoted himself more and more to painting, in which he exhibited

delicacy, freshness of lesign, and a brilliant technique. In 1913 he resumed his work in sculpture. He received numerous medals. In 1898 he was elected Chevalier of the Legion of Honor, and two years later won the grand prize at the Paris Exposition. He was a member of various national art associations. In 1919 he executed a colossal group, representing Cinic Virtue, for New York City. D. March 22, 1937.

MACMULLEN, Wallace, American Methodist Episcopal clergyman: b Dublin, Ireland, Aug 31, 1860. He came to the United States with his parents in 1862 and was graduated from the Drew Theological Seminary in 1888, entering the Methodist ministry in that year. He was pastor at Springfield, Mass, in 1888-93; at Grace Church, Philadelphia, in 1893-98; at Park Avenue Church, Philadelphia, in 1898-1902; at the Madison Avenue Church, New York City in 1902-13 From 1913 to 1918 he was professor of homiletics at the Drew Theological Seminary, and from 1925 was pastor of the Metropolitan Temple, New York City. Author of Captain of Our Fasth (1904).

McMURRICH, James Playfair, Canadian scientist b. Toronto, Ontario, Oct 16, 1859. Graduated from the University of Toronto m 1879, he received his Ph.D. from Johns Hopkins in 1885. From 1884-86 he instructed at that institution in mammalian anatomy. He held a professorship in biology at Ontario Agricultural College (1882-84); at Haverford (1880-89); at Cincinnati (1892-94). From 1889-92 he was assistant professor of morphology at Clark University; professor of anatomy in the University of Michigan (1894-1907), and afterwards was at Toronto University. He published Invertebrate Morphology (1894); The Development of the Human Body (1902). D. Feb. 10, 1939.

McMURRY, Charles Alexander, American educator b. Crawfordsville, Ind., Feb. 18, 1857. He was graduated at the Illinois Normal University in 1876, at the University of Michigan in 1880 and at the University of Italie in 1887. He was principal of the Practice School at the Illinois State Normal University in 1899-1900; principal of the Practice School at the Northern Illinois Normal School in 1900-01; and after 1915 he was professor of elementary education at the George Peahody College for Teachers, Nashville, Tenn. Author Method of Recitation with his brother, F. M. McMurry (1898); Special Method in Reading (1898); and a series of textbooks including Literature and History (1898); Geography (1898) Natural Science, 2d ed. (1899); Manual Arts; Arithmetic (1906); Teaching by Projects (1919); How to Organize the Curriculum (1923). D. March 1929.

McMURRY, Frank Morton, American educator, brother of Charles Alexander McMurry (qv.): b. near Crawfordsville, Ind., July 2, 1862. He studied at the imversities of Michigan, Halle, Jena, Geneva and Paris. He was professor of pedagogy at the State Normal School, Normal, Ill, in 1891-92; and at the University of Illmois in 1893-94; professor of pedagogics and dean of Teachers' College, University of Buffalo, in 1895-98. In 1898-1926 he was professor of elementary education at Teachers' College, Columbia University. He was author of Tarr and McMurry Common School Geographies, with Ralph S, Tarr (1900); Method of

Recitation, with C. A McMurry (1898); How to Study and Teaching How to Study (1909); McMurry and Benson, Social Arithmetics (1926). D. Aug. 1, 1936.

McMURTRY, Lewis S., American surgeon: b. Harrodsburg, Ky., Sept. 14, 1850; d. Feb. 1, 1924. He was educated at Centre College, Kentucky, and at Tulane University. He specialized in gynecology and abdominal surgery, becoming professor of those subjects in the medical department of the University of Louisville, where he afterward became president of the medical feather. the medical faculty. He was surgeon at the Louisville City Hospital, and was president of the American Medical Association in 1906-07. He contributed to the *International Text Book* of Surgery.

McNAB, Sir Allan Napier, Canadian statesman; b. Niagara, Ontario, Feb. 19, 1798, d. Aug. 8, 1862. He entered the navy as midshipman in 1813, but soon abandoned the navy for the army; was present at the capture of Fort Niagara, and commanded the advance guard at the battle of Plattsburg. At the close of the war he studied law and practiced in Hamilton, and in 1829 was elected a member of the assembly, and speaker 1837-41. During the insurrection of 1837-38 he commanded the militia on the Niagara frontier, routed the insurgents near Toronto Dec. 7, 1837; and a party of American sympathizers having occupied Navy Island in the Niagara River, whence they were cannonading the village of Chippewa on the Canadian side, he sent a party to seize the steamer Caroline, employed to convey them supplies, and having driven the crew ashore, set fire to it and sent it over the Falls. For his services to the crown during this insurrection McNab was knighted In 1854 he was prime minister under the earl of Elgin, retaining office for a few months under his successor, Sir Edmund Head. On retiring in 1856 he was made a baronet.

McNAIR, măk-năr', Frederick Vallette, American naval officer: b. Jenkintown, Pa, Jan. 13, 1839; d. 1900. He was educated at the United States Naval Academy and served in the Municota 1857-59. In 1861 he became lieutenant, and during the Civil War took part in the bombardment of Forts Jackson and Saint Philip, the capture of New Orleans and the destruction of the Confederate ram Arkansas. He was instructor at the naval academy 1867-68, in 1872 became commander and in 1887 was placed in command of the Omaha in the Asiatic squadron In 1890 he became superintendent of the Naval Observatory. In 1895 he was made admiral, a member of the lighthouse board in 1898, and in July of the last-named year was appointed to take charge of Admiral Cervera and other Spanish prisoners of war. Upon their return to Spain he was appointed superintendent of the naval academy.

McNAIR, Leslie James, Lieutenant General of the United States Army; the Commanding General of the Army Ground Forces; according to General Marshall "the brains of the army"; killed in France in July 1944. Leslie McNair was born in Verndale, Minnesota, on May 25, 1883. He graduated from the United States Military Academy in 1904 and was com-States Military Academy in 1904 and was com-

missioned a 2d lieutenant of artillery. On becoming a 1st lieutenant in 1905 he transferred to the Ordnance Department and was stationed at Sandy Hook Proving Ground, New Jersey, and later at Watertown (Mass) Arsenal. In June 1908 he returned to field artillery and after four years went abroad to observe French artilfour years went abroad to observe French artiflery practice. From 1913 to 1916 he was at Fort Sill, Oklahoma, and then went to Mexico with General Pershing. In June 1917 he began a distinguished career in France on a staff with his friend George C. Marshall. He was promoted rapidly: lieutenant colonel 1917; colonel 1918; and at 35 years was the youngest brigadier general in the army. He extrad the Distinguished eral in the army. He earned the Distinguished Service Medal for skill in the use of artillery. After the First World War he reverted to

his permanent grade of major and during the next 15 years had various assignments: instructor, Fort Leavenworth; General Staff in Hawaii, pro-fessor of Military Science and Tactics at Pur-due University; Artillery School, assistant commandant. He became a lieutenant colonel in 1928 and in 1935 as executive officer in the office of the Chief of Field Artillery was promoted to colonel. He was later commander of the 2d Field Artillery Brigade, Fort Sam Houston, and then commandant at the Command and General Staff School, Fort Leavenworth.

The big assignment came in July 1940 when as chief of staff, General Headquarters, he was charged with directing the gigantic training program. When the army was streamlined in 1942 he retained these duties becoming commanding general, Army Ground Forces, with rank of leutenant general. His program included: factual training films; stiff obstacle courses, dangerous training under live ammunition maneuvers, realistic and tough. These he knew to be the only fit preparation for combat. Starting with about 1,000,000 men he finished with a trained army of nearly 8,000,000. In July 1944, satisfied that the Job was done, he sought and received assignment to the field. Shortly afterward in France, while observing, he was killed by the unfortunate misdirection of one of his own army's bombs.

MACNAMARA, Thomas James, British statesman and author: b Montreal, Canada, Aug. 23, 1861, d. Dec. 3, 1932 He went to England at an early age and was educated at Saint Thomas School, Exeter, and at the Borough Road Training College for Teachers. He was engaged in teaching in 1876–92 and was president of the National Union of Teachers in 1896. Elected to Parliament for North Camberwell in Elected to Parliament for North Camberwell in 1900, he served as parliamentary secretary of the Local Government Board in 1907-08 and to the Admiralty in 1908-15, in 1908-20 was financial secretary to the admiralty and minister of labor 1920–22. He was author of numerous textbooks.

McNAUGHTON, Andrew George Latta, Canadian soldier b 1887. Commander in chief of the Canadian Active Service Force from 1940. General McNaughton was educated at Lennoxville and at McGill University, the Royal Staff College, Camberley, and the Imperial Defense College, London. During the war of 1914–18 he served in France and Belgium; became chief of the Canadian General Staff in 1929 and was president of the National Research Council of Canadia from 1925 to 1930. In 1939 de heccome Canada from 1935 to 1939. In 1930-40 he commanded the 1st Division of the Canadian Overseas Force.

MacNEIL, Hermon Atkins, American sculptor: b. Chelsea, Mass, 1866. He was graduated at the Massachusetts State Normal School in 1886; and later spent two years in study under Chapu at Julien Academy, and two years under Falguière at the École des Beaux Arts in Paris. He afterward taught for three years at Cornell, and three years also at the Art Institute, Chicago He won the Roman Rhinehart scholarship in sculpture for 1896-1900 He was awarded the medal in design at the Chicago Exposition in 1893; received the silver medal at the Paris Exposition in 1900; the gold medal at the Buffalo Exposition in 1901; and the gold medal at the Panama Exposition in 1915. He was engaged in important decorative work for the expositions at Chicago, Paris, Buffalo and Panama. He executed the spandrels on the portico of the National pavilion at the Paris Exposition, where he exhibited the groups The Sim Vow and the Last Act of the Moque State Dance. The main cascade fountain at the Saint Louis Exposition was his work, and he served on the jury of awards. Among his other work may be mentioned The Coming of the White Man (City Park, Portland, Ore); McKimley Memorial (Columbus, Ohio); General Washington (Washington Arch, New York). His work is represented at the Art Institute, Chicago; Peabody Institute, Baltimore; Cornell University; the Metropolitan Museum, New York; and Johns Hopkins University.

MacNEVIN, or MACNEVEN, William James, American physician: b. Ballynahowne, County Galway, Ireland, March 21, 1763; d. New York, July 12, 1841. When 12 years old he was placed in the care of his uncle, Baron O'Kelly MacNevin, court physician in Austria, and he received his education at the universities of Prague and Vienna, taking his medical degree at Vienna in 1784. He then returned to Ireland and engaged in practice at Dublin. He was arrested with Thomas Addis Emmet in 1798 and imprisoned for four years; joined the Irish Legion under Napoleon and after three years came to the United States and practiced medicine. In 1808 he was professor of obstetrics in the College of Physicians and Surgeons and in 1811 professor of materia medica. He was author of Rambles through Switzerland (1803); Chemical Examination of the Mineral Waters of Schooley's Mountain (1815); Exposition of the Atomic Theory of Chemistry (1819).

McNICHOLAS, (Rt. Rev.) John T., Roman Catholic bishop: b. Kiltimagh, Ireland, Dec. 15, 1877. He was brought to the United States in 1881, and educated at St. Joseph's College, Philadelphia; St. Rose College, Springfield, Ky., and St. Joseph's College, Somerset, Ohio. He was ordained priest in 1901; was lector of sacred theology, Minerva University, Rome, in 1904, and in 1904-05 was a professor at the Dominican House of Studies, Somerset, Ohio; at Washington, D.C., 1905-09; was pastor of St. Catherine of Siena, New York City, 1913-16, and archbishop of Cincinnati in 1925.

McNUTT, Paul Vories, American public official: b. Franklin, Ind., July 19, 1891. He graduated at Indiana University in 1913, received

a law degree from Harvard in 1916, and practiced law at Martinsville, Ind., becoming assistant professor of law at Indiana University in 1917 and dean of the law school in 1925. In 1933 he was elected governor of Indiana and served until 1937 when President Franklin D. Roosevelt named him as high commissioner to the Philippines, serving until July 1939, when he resigned to become federal security administrator, a new position in which he supervised the system of social security payments. In the First World War he was a major of field artilery and after the war commanding officer of the 320th Field Artillery. He received decorations from the governments of Poland and France, and was national commander of the American Legion 1928–29.

MACOMB, Alexander, American general: b Detroit, Mich., April 3, 1782; d Washington, D.C., June 25, 1811. He entered the United States Army in 1799 as a cornet of cavalry, and in 1812 held the rank of lieutenant colonel of engineers and adjutant general of the army. In January 1814 he was promoted brigadier general and placed in command of that part of the northern frontier bordering on Lake Champlain At Plattsburg, on Sept 11, 1814, he sustained the attack of a greatly superior British force under Sir George Prevost, which, after the defeat of the British squadron on Lake Champlain on the same day, retreated to Canada. For his firmness and courage on this occasion he was commissioned a major general, and received the thanks of Congress and a gold medal. In 1835 he succeeded to the office of commander in chief of the army, which held until his death. He wrote a Treatise on Martial Law and Courts Martial, as Practised in the United States (1809). Consult Richards, Memoir of Alexander Macomb (New York 1833).

MACOMB, III., city and McDonough County seat, alt 702 feet, 202m. by rail SW. of Chicago, with an airport (privately owned). Located in a farming region, it makes porcelain electrical insulation, poultry equipment, pottery and stoneware, milk products, and automobile license plates. The public library is well-stocked. The city is the seat of the Western Illinois State Teachers College, with seven buildings on a 70-acre campus. Settled in 1830, Macomb was named for Gen. Alexander Macomb (q.v.), who commanded the United States Army from 1828 to the time of his death, It was incorporated as a town in 1830, and as a city in 1856; has a mayor and council, and a city-owned water-supply system. Pop. (1930) 8,509; (1940) 8,764.

MACON, mā'kôn, Nathaniel, American statesman: b. Warren County, N.C., Dec 17, 1758; d. there, June 29, 1837. He was educated at the College of New Jersey, now Princeton; in 1776 he left college and served during the summer in the New Jersey militia. During the following three years he studied law; then from 1780 he served as a common soldier in the Continental Army till the provisional treaty of peace in 1782, refusing any pay or military distinction. When the Constitution of the United States was submitted to North Carolina, he opposed it, asserting it bestowed too much power on the government, and made it in effect independent of the state. He never lost this dislike of the Constitution, and had unlimited confidence in the capacity of the people for self-government;

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his favorite saying being that «if left alone they would always do what was right.» He was a member of the United States House of Representatives 1751-1815, and in 1816 was elected to the Senate, where he served till 1828, when he resigned his seat, having been then a member of Congress for 37 successive years.

MACON, France, capital city of the department of Sâone-et-Loire, on the Sâone River, 45 miles north of Lyons on the Paris-Lyons Railway. A bridge of 12 arches crosses the river to the opposite suburb, Saint Laurent. The cathe-dral of Saint Vincent, built in the 12th and 13th centuries, was destroyed at the time of the Revolution, but a portion of it is still used as a chapel and the façade and towers remain. There is the modern church of Saint Pierre, a Romanesque structure with two fine spires and a threenaved basilica. Macon was the Roman Matisco Eduorum and in the 16th century was a stronghold of the Huguenots. It suffered severely in different invasions. It is the seat of a prefecture, and has tribunals of the first instance and of commerce. It has excellent schools and training colleges, and important commercial and manufacturing interests, as well as being a railway center. It has a large trade in wine, and manufactures supplies for the wine trade as well as being engaged in copper-founding, and making machinery, tools and paper. A statue in the town commemorates the birth there of Alphonse Lamartine, the poet. Pop. about 16,000.

MACON, Ga., city and Bibb County seat; alt. 337 feet; at the head of navigation of Ocmulalt. 33/ feet; at the head of navigation of Ocmulgee River; 88m. SE. of Atlanta, on the Georgia; Central of Georgia; Southern; Georgia Southern; and Macon, Dublin and Savannah railroads, and federal and state highways; with the Herbert Smart Municipal Airport, 6½ miles east, served by Eastern Airlines. On the Dixie Highway, both north and south of the city, is a 'Memorial Mile' with bronze markers for World Wardend of this county and alertings of spiral War dead of this county and plantings of spirea, crepe myrtle, and pecan trees. Palmettos and roses grow in profusion. The Bibb County Camellia Show and Bibb Flower Show are held each Spring. At Porterfield, a show place (8 miles south) with a Norman style farmhouse, are wonderful test gardens of roses. Peaches (blooming in late March and early April), (blooming in late March and early April), vegetables, corn, watermelons, and cotton grow in the outlying country, which has pine forests and deposits of clay and kaolin. In Colonial times, Georgia kaolin was shipped to England for use in the Wedgwood potteries. On these natural resources of raw materials, and the power from the Ocmulgee's drop of 90 feet in the seven miles above the city, Macon's industries are based. Of a dozen cotton mills, the largest are Bibb (established in 1876), Atlantic and Willingham. Their varied products include varn, twine, duck, tire fabric, hossery, and yarn, twine, duck, tire fabric, hosiery, and underwear. There are several large cottonseed oil mills operated here. Gristmills, canneries (including pimento packing), slaughterhouses and tanneries have been less important than clay and kaolin products with raw materials especially from near-by Dry Branch and Jeffersonville. Lumber, sash and doors, crates and baskets, furniture, and creosoted timber have a high product value. Sawmill equipment is a feature of the machine shops, and most of the railroads that enter Macon have shops here. A large circus

and some racing stables make this their winter quarters. Macon is an important shipping point, and has a large wholesale trade.

The city is governed by a mayor and council of 12 aldermen. In 1911 the state legislature authorized it to own and operate the waterworks and to introduce a civil service system for police and fire departments. The City Hall (1836; remodeled 1935), in the prevailing Classic Revival style of the city, was the state Capitol for the last four months of the Confederacy, and it now houses the Historical Society and Art Association. There is an art room with Indian relics in the Municipal Auditorium (1925; 4,000 seats), which has a copper-covered dome 156½ feet in diameter There are historical murals in this auditorium, in the Washington Memorial Library building (1919; library, 1874), and in the Citizens and Southern National Bank (1933). The city has its own stadium and several parks: Baconsfield along the river's left bank, faced by two large cemeteries on the right bank; Central City Park in the southeast, with grounds of the Macon professional baseball team (Peaches) and of the Georgia State Exposition (held in October); and in the southwest corner, Tattnall Square (18 acres). South of this square is the 63-acre campus of Mercer Uni-versity (Southern Baptist), moved here in 1871 from Penfield. On the same College Street is Wesleyan Conservatory, music and fine arts department of Wesleyan College, chartered in 1836, the first institution empowered to give women degrees. It opened in Macon in 1839, but in 1928, all but the conservatory was moved to Rivoli, seven miles to the northwest, where a dozen Georgian Colonial buildings have been erected on a campus of 170 acres. Georgia Baptist College for Negroes (1889; coeducational) is five miles northeast of the city with a campus of 205 acres; 30 acres, formerly belonging to the College, are now a Macon recreation park. The Georgia Academy for the Blind, two miles west, was started by private gifts in 1851 and taken over by the state in 1852; the present building was erected in 1906.

Macon is the birthplace of Sidney Lanier, poet and musician, and Georgia's best known man of letters. The Lanier home is marked with a marble tablet, set into a terrace. Several residences are good examples of the Classic Revival: the Baber House, built before 1840, owned for a time by Mrs. Howell Cobb, and used since 1920 as a clinic; the Cowles-Walker House (1830), now owned by Scottish Rite Masons; the Cowles-Bond-O'Neal (1836); the H-plan Coleman House, similar to Stratford Hall in Virginia (1840); and the particularly fine Ralph Small House (1846).

The Macon area is full of prehistoric remains representing several stages of Indian culture. Just outside the city on the southeast is the Ocmulgee National Monument, with a million-dollar fund, the largest archeological research area in the United States. In the farther part of the Monument, the Lamar Mounds and Village Site have one conical and one pyramidal mound, both apparently temple site; and traces of houses 20 to 25 feet square, which had thatched cane roofs covered with clay and puddled clay floors. The pottery found here is glossy with paddle-marked designs. Nearer the city is the Macon Plateau part of the Monument; it has four mounds, a council chamber 42 feet

in diameter with 50 clay seats around the wall, a prehistoric cornfield better preserved than any elsewhere. One of the plateau mounds was decorated on its sides and top with bright colored clay bands, yellow, blue and red There are other interesting Indian remains in Brown's Mount, which has a smaller council room with built-in seats, and Shell Rock Cave, where red flint and jasper implements occur, and many

marine fossils

By 1805 the Indians had ceded to the state all the land between the Oconee and the Ocmulgee. A military post, Fort Hawkins, was built on the east side of the Ocmulgee in 1806 spot is marked by a blockhouse put up in 1938) Here troops gathered for Jackson's southern campaign in the War of 1812; and here came the first settlers from North Carolina in 1818. They called the place Newtown. After the Indians ceded (1821) to the state the lands west of the Ocmulgee, a settlement across the river in 1823 was named in honor of the North Carolina patriot, Nathaniel Macon. Two years later when LaFayette visited it, there were 700 inhabitants. In 1829 Newtown became a part of Macon. In 1832 Macon became a city and was an important point for shipping cotton down-stream to Darien by oared flatboats In 1833 the first steamboat carried cotton. In the next decade a railroad to the south connected Macon with Savannah, and one to the north from Macon had given Atlanta its start. Soon railway bridges blocked river traffic above the city In the 1850's Macon grew rapidly and made bids for direct trade with Europe. In 1860 it held its Belgian Fair and Cotton Planters' Exposition In the Civil War it was important to the Confederate cause as a gold depository, a center for commis-sary supplies, and one of Georgia's four munisary suppries, and one of Georgia's four muntion-making cities. In 1864 it was threatened, but not taken, by Union forces; and it was finally occupied only after the armistice in April 1865. In the '70s the first large-scale textile mills were built. In the Spanish-American War one of Georgia's six training camps was here; in the World War, Camps Harris and Wheeler; and in 1941, Camp Macon, the second largest in the state. In 1906 the levee was improved and flood danger minimized.

The Macon Telegraph was founded in 1826, first published as a daily temporarily in 1831, and in 1865 cost \$120 (Confederate) for a year's subscription. An evening paper (1884) year's subscription. An evening paper (1884) and a Sunday edition (1930) are under the same management as the *Telegraph*. The *Wesleyan Christian Advocate* moved to Macon from Charleston, S. C., in 1865. WMAZ, local broadcasting station, is one of the oldest in the state. In 1900 almost half the population was Negro; in 1930 about 45 per cent. The population from 1800 to 1940 increased more than 150 per cent. 1890 to 1940 increased more than 150 per cent, 1900-10 being the decade with the largest relative and actual growth, as some suburbs were annexed then: (1920) 52,995; (1930) 53,829; (1940) 57,865. Consult 'The Macon Guide and Ocmulgee National Monument (Macon, 1939), a Federal Writers Project, sponsored by the Macon Junior Chamber of Commerce.

MACON, Miss., city and Noxubee County seat, alt. 179 feet, on the Gulf, Mobile and Ohio Railroad and on state and federal highways, 108m. NE. of Jackson. Industries: cotton and lumber. Government: mayor-council. The city has a WPA library and a hospital. It was in-

corporated in 1836. During the Civil War. Macon was for a while scat of the state government. Pop (1940) 2,261.

MACON, Mo, city and Macon County scat; alt 874 feet; 170m. NW. of St Louis; on the Burlington, and the Wabash railroads. It is a shipping center for the agricultural products of the surrounding area, and for livestock. Grains are the principal crops. The city, situated in a grove of maples, has a public library. There is in Macon an osteopathic sanatorium, two of whose founders were sons of Dr. Andrew Taylor Still (q.v.), founder of osteopathy. Dr. Still was born in Virginia, but spent many years at Kirksville, in Adair, the county adjoining Macon on the north, working out his theory of drugless healing In 1892 he established there what is now the Kirksville College of Osteopathy and Surgery. The sanatorium at Macon specializes in osteopathic treatment of nerve diseases. The town of Macon was founded in 1856. It and the adjoining town of Hudson were merged in 1859 to form the present city, and became the county seat in 1863. Pop. (1930)

3,851, (1940) 4,206.

MACORIS, ma'kō'res', Santo Domingo, seaport on the southern shore of the island of Haiti on Macoris Bay, about 40 miles east of Santo Domingo. The manufacture of sugar and a considerable import and export trade constitute the town's chief activities. A United States consular agent is located here. Pop. about 7,000. Macoris is also the name of a smaller town in northern Santo Domingo, near

Santiago

MACOUN, ma-koon', John, Canadian hotanist: b. Ireland, 1832; d. 1920. He removed to Canada at 18 and from 1868 to 1879 was pro-Belleville, Ontario. In 1882 he became botanust to the Geological and Natural History Survey of Canada and was appointed in 1887 assistant director of the survey. He has published 'Manitoba and the Great Northwest' (1882); 'The Forests of Canada and Their Distribution' (1895); an exhaustive report on the Yukon country; and catalogues of Canadian plants and birds.

MACPHAIL, Sir Andrew, Canadian physician and editor b. Orwell, Prince Edward Island, 24 Nov. 1864; d. 23 Sept. 1938. Educated at the Prince of Wales College, McGill University and at the London Hospital. He was versity and at the London Hospital. He was principal of the Fanning Grammar School in 1882–85; was engaged in journalism in 1889–93; afterward traveling in the East. In 1895-1906 he was pathologist to the Western Hospital and Verdun Hospital for Insane. In 1907-37 he was professor of the history of medicine at McGill University Author of 'Essays in Puritanism' (1905); 'The Vine of Sibmah' (1906); 'Essays in Fallacy' (1910); 'The Book of Sorrow' (1916); 'Official History of the Canadian Forces in the World War.' He was knighted in 1918.

MACPHEE, John Joseph, American neurologist: b. Canada, 8 July 1860; d. New York, 18 Feb. 1941 He was educated at the Prince of Wales College and at the University of Vermont where he took his M.D. in 1890. He was pathologist at the Post-Graduate Medical Col-Verdun Hospital for Insane. In 1907-37 he was

pathologist at the Post-Graduate Medical College of New York in 1891-94; after which he became professor of nervous and mental diseases at the New York Polyclinic Medical School and Hospital. He was also consulting neurologist at Saint John's Hospital, Brooklyn; Beth Israel Hospital, New York; and at Saint Francis' Hospital, New York.

MACPHERSON, măk-fer'son, SIR David Lewis, Canadian statesman b Inverness, Scotland, 12 Sept 1818; d 16 Aug 1896 He was educated at the Royal Academy in his native town, removed to Canada in 1835 and after becoming in 1842 a partner in a forwarding firm in Montreal secured in 1851, with others, a charter for a railway from Montreal to Kingston, the beginning of the Grand Trunk Railway In 1872 he became president of the Interoceanic Railway Company, the rival to the Canadian Pacific, in competing for the transcontinental railway charter He sat in the Legislative Council of Canada 1864–67, and in the lastnamed year entered the Dominion Senate and was elected its speaker in 1880 He was Minister of the Interior 1883–85 and was created K C M G in 1884

McPHERSON, Edward, American journalist b Gettysburg, Pa, 31 July 1830; d. there, 14 Dec. 1895 Iu 1848 he was graduated from the University of Pennsylvania, and although he studied law soon gave it up for journalism He sat in Congress 1858–66, was clerk of the House of Representatives 1868–73, 1881–83, and 1889–91, in 1876 permanent president of the National Republican Convention, and was chief of the Bureau of Engraving and Printing in Washington 1877–88 He edited the Philadelphia Press 1877–80, was for some years the American editor of the 'Almanach de Gotha'; edited from 1872 a biennial 'Handbook of Politics'; and the 'New York Tribune Almanac' from 1877 till his death He was the author of a 'Political History of the United States during the Great Rebellion' (1865); and 'The Political History of the United States during Reconstruction' (1870).

MACPHERSON, James, Scottish author and translator b. Inverness-shire, 1736; d 1796 He studied at Aberdeen and Edinburgh Having published 'Fragments of Ancient Poetry,' translated from the Gaelic or Erse language, a subscription was raised to enable him to collect additional specimens of national poetry. He produced, as the fruit of his researches, 'Fingal, an Ancient Epic Poem,' translated from the Gaelic (1762, quarto); 'Temora and other Poems' (1763), professedly translated from originals by Ossian, the son of Fingal, a Gaelic prince of the 3d century, and his contemporaries The question of the poem's authenticity gave occasion for violent controversy It may be concluded that Macpherson's prose epics were founded on traditional narratives current in the Highlands; but the date of the oldest of the lays is comparatively modern, and it is now impossible to ascertain the precise extent of his obligations to Gaelic bards. Macpherson himself never made any serious attempt to vindicate himself against the charge of forgery He had a life allowance from the government, and was agent to the Nabob of Arcot, having also a seat in the House of Commons, 1780-96 He was also the author of a very inadequate prose translation of Homer's 'Iliad' and of some other works.

McPHERSON, James Birdseye, American soldier b. Clyde, Ohio, 14 Nov. 1828; d. Atlanta, Ga., 22 July 1864. He was graduated

from West Point in 1853. Appointed brevet 2d licutenant of engineers, he was assistant instructor of practical engineering at West Point, 1853-54, and after serving on fortifications and construction duty on the defenses of the harbor of New York and the improvement of the Hudson River (1854-57), was given charge of the construction of Fort Delaware (1857-61) and of the defenses of Alcatraz Island, San Francisco, Cal He applied for active employment in the field at the opening of the Civil War In May 1862 he was appointed brigadier-general of volunteers and was with Halleck at the siege of Corinth For his services on this occasion he was made major-general of volunteers in the following October He took an important part in the siege and capture of Vicksburg and was in consequence promoted to brigadier-general in the regular army, 1 Aug. 1863. In March 1864 he was made commander of the Department and Army of the Tennessee and performed distinguished services in the campaign of Georgia In the following July he commanded in the engagement around Atlanta and was killed during a reconnaissance A statue has been erected in his honor at Washington, D C, by the men who fought with him in the Army of the Tennessee.

McPherson, Kans, city and McPherson County seat; alt. 1,480 feet; on the Chicago, Rock Island and Pacific; Union Pacific; Missouri Pacific; and Santa Fe railroads; about 128m. SW. of Topeka Oil and gas were discovered in 1929 and there are oil refineries, plants recovering gasoline from natural gas, and oil field supply houses. Wheat and corn are raised near by. The chief industries include flour and feed mills, a cheese factory, and cement mills. McPherson College (q.v.), Central Academy and College, a Carnegie library and McPherson College Library and Museum are among the city's educational facilities The city is named for the Civil War leader, Gen. J. B. McPherson (q.v.). Pop (1940) 7,194.

McPHERSON COLLEGE. This institution was established in McPherson, Kansas, in 1887, and opened its doors for the first time on 5 Sept 1888 Dr. S Z. Sharp was the chief promoter of its founding The college is the property of the Church of the Brethren (sometimes called Dunkards) and the control is exercised by a board of trustees representing the 16 church districts which make up Kansas, Nebraska, Missouri, Oklahoma, Colorado, Iowa, Minnesota, North Dakota, Idaho, Texas and Louisiana. A local executive committee consisting of the president of the college and 5 trustees selected by the board of trustees at large, actively supervise the work of the college between meetings of the While the college is affiliated with the Church of the Brethren no religious tenets are required for admission. The annual enrolment in all departments is between 500 and 550. It offers courses leading to the AB. and BS. degrees. The college is co-educational. The chief emphasis is on the liberal arts, but it also offers work in music, manual arts, commerce and home economics. The college has a strong faculty and a modern curriculum. The endowment assets are \$302,442.74, the value of the buildings and grounds is \$492,604.48 The college has a church constituency of nearly twenty-one thousand. The college plant consists of 15 acres of campus and

In 1841 he became a theatre manager of Drury Lane, but met with no success, so that he resigned at the end of the second season His managership at Drury Lane had brought upon him considerable financial loss, to repair which he made his third visit to America (1848-49). There he was involved in an unfortunate quarrel with the American actor, Forrest, which in May 1849 culminated in a riot at the Astor Place Opera House, New York, at which Macready was appearing as Macbeth, and in consequence was obliged to leave the country. On his return to London he gave some farewell performances, and then retired from the stage in 1851.

McREYNOLDS, măk-rĕn'oldz, Clark, American lawyer, cabinet officer and jurist: b Elktown, Ky, 3 Feb 1862. He was graduated at Vanderbilt University in 1882 and from the law department of the University of Virginia in 1884. He engaged in law practice at Nashville, Tenn., attaining a distinguished reputation; and in 1900-03, without relinquishing his practice, he was professor at the Law School of Vanderbilt University. While of Democratic party affiliations he was appointed Assistant Attorney-General under the Roosevelt administration in 1903-07, after which he engaged in law practice in New York. He was on several occasions retained as counsel by the United States in service connected with the application of the anti-trust laws, his part in dealing with the tobacco trust and with the anthracite coal dealers and the railroads being especially prominent. In 1913 he was appointed United States Attorney-General by President Wilson, succeeding Attorney-General Wickersham. While in office the cases of the Union and Southern Pacific Railroad merger, the International Harvester Company, the American Telephone and Telegraph Company, the Reading Company and the New York, New Haven and Hartford, under the Sherman Anti-Trust Law, came under his direction. He was appointed associate justice of the Supreme Court of the United States in August 1914 and took his seat in October

MACROBIUS, ma-krō'bi-ŭs, Ambrosius Aurelius Theodosius, Latin author of the 5th century Add. The country of his birth is uncertain, but it is inferred from the fact that he speaks of Latin as a foreign tongue to him that he was probably a Greek. He was the author of a miscellaneous work entitled 'Saturnalia,' curious for its criticisms, and valuable for the light it throws upon the manners and customs of antiquity; a commentary on Cicero's 'Somnium Scipionis,' in two books, valuable for the exposition it affords of the doctrines of Pythagoras with respect to the harmony of the spheres; and a treatise, 'De Differentiis et Societatubus Græci Latinique Verbi.' Consult Von Jan, 'Macrobius'; and Eyssenhardt, 'Macrobi Opera'; also Wissowa, G., 'De Macrobii Saturnaliorum Fontibus' (Breslau 1880).

MACROCOSM. See MICROCOSM.

MACROCYSTIS, măk'rō-sis'tis, a genus of brown seaweed of the family Laminariaceæ, generally known as giant kelp. It is common throughout the southern temperate zone and along the Pacific Coast of the United States. It has a much-branched root from which rises

many filiform simple or branched stems without leaves below, but bearing numerous lance-like leaves above. The stems reach the greatest length known in the vegetable kingdom. Observations by Hooker near the Crozet Islands report specimens fully 700 feet long; and other authorities state that a length of 900 feet is sometimes attained.

MACROTHERIUM, a genus of extinct ungulate mammals, in some cases of gigantic size, found most completely in the Miocene deposits of Europe, but also known from China and western North America. It represents the primitive group Ancylopoda, which had a wide geographical range in the Miocene and Pliocene epochs when it became extinct. The structure of the curiously twisted feet so much resembles that of the ground-sloth that for a long time the macrotheres, as well as their companion, but more generalized, genus Homalodontotherium, were regarded as edentates. Consult Woodward, (Vertebrate Palæontology) (1898).

MACRURA. See DECAPODA.

McTYEIRE, măk-tār', Holland Nimmons, American Methodist Episcopal bishop: b. Barnwell County, S. C., 28 July 1824; d Nashville, Tenn, 15 Feb. 1889. He was graduated at the Randolph-Macon College, Virginia, in 1844, and in 1845 entered the ministry, joining the Virginia Conference. In 1846 he was assigned to Saint Francis Street Church, Mobile, Ala, and after serving in the churches at Demopolis, Ala, and Columbus, Miss., he was transferred to the Louisiana Conference. He was editor of the New Orleans Christian Advocate in 1851–58, and from 1858 until its publication was interrupted by the Civil War he edited the Nashville Christian Advocate. During the war he served as pastor of the church at Montgomery, Ala. He was elected bishop in 1866, and in 1873 he became president of the board of the newlyfounded Vanderbilt University He was senior bishop for some time before his death Author of 'Duties of Christian Masters' (1851); 'Catechism on Church Government' (1869); 'Manual of Discipline' (1870); 'History of Methodism' (1884); 'Passing Through the Gates' (1889), etc

MACŪ, ma'koo, a nomadic Indian tribe of the Amazon region. They range through northwestern Brazil, more particularly along the Rio Negro They are of the lowest type of savages of South America, provide neither shelter nor clothing and plant no crops They live by hunting and fishing, are hostile and apparently have no connection with other tribes. A report of their condition was made by Theodor Koch-Grunberg in 'Anthropos' (Vol I, pp. 877–906, 1906).

MacVEAGH, māk'vā, Franklin, American cabinet officer, brother of Wayne MacVeagh (q.v.): b. near Phœnixville, Pa., 1837; d. 6 July 1934. He was graduated at Yale in 1862 and took his LL.B at Columbia University in 1864. He was admitted to the bar in 1864; and in 1864-66 was engaged in practice in New York. His health failing he went to Chicago in 1866 and there engaged in the wholesale grocery business. After the great fire in 1871 he established the firm of Franklin MacVeagh and Company, wholesale grocers, and he also became connected with various banking and

manufacturing interests He became president of the Citizens' Association of Chicago in 1874 and was largely responsible for many important reforms He was Democratic candidate for United States senator against Senator Cullom in 1894 but was defeated. From 1896 he was associated with the Republican party, and in 1909 he was appointed Secretary of the Treasury by President Taft, serving throughout the Taft administration. He was vice-president of the American Civic Association in 1905; served as president of the Chicago bureau of charities and of the Municipal Art League; and was a founder and member of the executive committee of the National Civic Federation.

MacVEAGH, Wayne, American lawyer and diplomat: b. Phœnixville, Pa., 19 April 1833; d. 11 Jan. 1917. He was graduated from Yale in 1853 and was admitted to the bar in 1856. He was district attorney of Chester County 1859-64, became prominent as a Republican leader, and conspicuous in his profession, and in 1870-71 was Minister to Turkey. He was an active opponent of "machine politics" and in 1872 led the Republican opposition to Simon Cameron, his father-in-law He was chairman of the "MacVeagh Commission" sent by President Hayes to Louisiana in 1877 to act as the President's unofficial representative and and in adjusting political differences there He was Attorney-General of the United States, March to September 1881, and was Ambassador to Italy 1893-97. In 1903 he was chief counsel of the United States in the Venezuela arbitration before The Hague Tribunal.

McVICKAR, William Neilson, American Protestant Episcopal bishop: b New York, 19 Oct. 1843; d 28 June 1910. He was graduated at Columbia College (1865); and at the General Theological Seminary (1868) He was ordained deacon (1867) and priest (1868). Being elected coadjutor bishop of Rhode Island, 19 Oct 1897, we was consecrated 27 Jan 1898, and on the death of Bishop Clark, September 1903, succeeded to the see

MACWHIRTER, mäk-wer'ter, John, Scottish landscape painter: b. Slateford, near Edinburgh, 27 March 1839; d London, 28 Jan. MACWHIRTER, 1911. He entered the Trustees' Academy, conducted by Robert Scott Lauder at Edinburgh, when 13 years of age, and at 15 made his first exhibition, 'Old Cottage at Braid,' at the Royal Scottish Academy At 16 he began his annual tours of Europe in search of material for his canvases, his travels eventually covering all parts of Europe and the United States as well. In 1867 he exhibited six pictures at Edinburgh and was elected to the Roval Scottish Academy. He made his first exhibition at the Royal Academy, London, in 1865, and in 1869 he settled permanently in London. He painted settled permanently in London. He painted some effective landscapes in California in 1877; was elected associate of the Royal Academy in 1879 and Academician in 1893. His landscapes are naturalistic and their popularity doubtless was enhanced by the tinge of literary significance he succeeded in giving them, together with a certain felicity in the selection of their titles. Among his work are 'The Lady of the Woods' (1876); 'The Three Graces' (1878); 'The Lord of the Glen' (1880); 'The Three Witches' (1886); 'Crabbed Age and Youth'

(1899); 'The Fallen Giant' (1991). His work is represented in the Royal Academy diploma gallery; the Walker Art Gallery, Liverpool; and in the municipal galleries at Manchester, Dundee, Aberdeen and Hull Author of 'Landscape Painting in Water Colors' (1901). Consult Spielmann, H. M., 'The Art of John Mac-Whirter'; Sinclair, W. M., 'John Mac-Whirter,' R.A.' (Art Journal Annual, Christmas, 1903).

MACY, Jesse, American historian; b. Henry County, Ind, 21 June 1842; d. 2 Nov. 1919 He was graduated from Iowa College in 1870 From 1871 to 1885 he was principal of the academy of Iowa College, in 1883-85 was acting professor of history and political science; in 1885-1912 professor of political science, and professor emeritus since 1912. In 1913 he was Harvard Foundation lecturer in French provincial universities. He received the degree of LLD from Brown University in 1898, from Grinnell in 1911 and from Oberlin in 1915. He has written 'Civil Government in Iowa' (1881); 'Institutional Beginnings in a Western State' (1883); 'Our Government (1886); 'A Government Textbook for Iowa Schools' (1887); 'The English Constitution' (1897); 'Political Parties in the United States, 1846-61' (1900); 'Party Organization and Machinery' (1904); 'Comparative Free Government,' with J. W. Gannaway (1915).

MAD ANTHONY, a nickname given to the Revolutionary general, Authory Wayne (qv), on account of the seeming recklessness of his brilliant multary feats

MAD APPLE, the fruit of an American nightshade, especially that called Sodom apple (Solanum sodomae), the eating of which produces poisonous intoxication.

MAD MULLAH, term applied to Mohammed Ali, the Mahdi, or Moslem Messiah: b. Somaliland, 1843; d. Omdurmau, 22 June 1885. In his youth Mohammed was initiated into the mysteries of the occult sciences and sorcery. A study of the Koran and the Arab writings followed in the Marabout school. When quite young the future Mullah was taken with the idea of making the pilgiimage to Mecca, and not content with one journey made the sacred visit three or four times. After his last pilgrimage Mohammed returned to Berbera, but met with small success. Establishing himself in a powerful inland tribe, his ascetic practices and bold demeanor gained for him a reputation for sanctity and spiritual gifts. In 1880 he proclaimed himself Mahdi ("the guide," i.e., in the way of salvation) and in 1881 he are the way of salvation), and in 1881 he pro-claimed a Jehad or holy war against the infidel and speedily aroused all the latent fanaticism of the fierce Sudanese tribesmen. From 1881-83 he destroyed nearly every force sent against him; and so threatening did his power become that the evacuation of the Sudan was ordered by the Egyptian government, Wolseley's expedition for the relief of Khaitum was too late to effect its purpose, the city was stormed in January 1885 and General Gordon murdered. His death is said to have occurred through poison administered at the hands of a woman he had outraged. His successor, Abd-Allah, carried on the struggle, until the power of Mahdism was finally broken at the battle of Omdurman in 1898 Consult Darmesteter, The Mahdi (London 1885), Hoffmann, Mahdithum (Kiel 1899), Muller, E., Beitrage zur Mahdilchre des Islams (Heidelberg 1901); Wingate, Mahdism and the Sudan (London 1901).

MAD TOM, local name in eastern United States for any of several types of small catfish native to fresh waters. They are long and slender, with mottled skin entirely naked, and have sharp pectoral spines with which a wound about as painful as a bee-sting may be inflicted. There are several varieties, ranging from a few inches to nearly a foot in length. They are known also as stone-cat, owing to their resemblance to the rocky or pebbly bottoms they frequent.

MADACH, mö'dach, Emerich, or Imre, Hungarian poet: b Also-Sztregova, Jan 21, 1823, d there, Oct 5, 1864 He studied Law, was a notary in his native country and was also active as an orator and journalist He wrote on archaeology and aesthetics, and both lyric and dramatic verse His principal works are the two dramatic poems Moses (1860); and The Tragedy of Man (1860) The latter owes much to Paradise Lost, and to Faust, but is yet a remarkable performance. Though strongly contemplative in character, it was successfully presented There is an excellent rendering in German by von der Lech (1888)

MADAGASCAR, măd-â-găs'kēr, an island in the Indian Ocean, since 1896 a French colony. It is separated by the Mozambique Channel from the southeast coast of Africa, the nearest point being 240 miles distant. It is 980 miles long from Cape Sainte-Marie in the south to Cape Amber (Ambre) in the north, and has an average breadth of 250 miles; greatest breadth 360 miles; total area 228,500 square miles; population (1946 census) 4,058,281 Exclusive of Australia and Greenland, generally classed as continents, it is the third largest island in the world, only New Guinea and Borneo being larger. For administrative purposes, the Comoro Archipelago (qv.) with several other islands lying adjacent to Madagascar, such as Nossi-Bé and Sainte-Marie, the islands of St Paul and Amsterdam in the South Indian Ocean, and certain Antarctic islands, are considered dependencies of Madagascar.

car.

The principal towns of Madagascar are the capital, Tananarive, or Antananarivo (pop. 170,000), in the interior, Tamatave (21,000), the largest port on the east coast; Majunga, Fianarantsoa, Diégo Suarez, and Antsirabe

The Land.—Madagascar consists of an elevated region with an average height of from 3,000 to 5,000 feet overlooked by mountains rising in some cases to over 9,000 feet above sea level. This plateau occupies a much larger proportion of the surface in the north and east than in the west and south; the greater portion of the island south of latitude 23° belongs to a much lower region which does not consist entirely of plains, but is interrupted toward the west by three prominent chains of hills stretching from north to south, one of them apparently in a continuous line about 600 miles in length. The coast has a number of indentations, mostly small, but a few good harbors, being in great part rock,

though in some places low and sandy.

The rivers are numerous, but few of them offer the advantages of internal navigation. The chief waterways are on the west and northwest side of the island. The Betsiboka with its affluent, the Ikopa, together measuring 300 miles, may be ascended by light steamers for 100 miles; the Tsiribihina has a somewhat shorter course, but drains by its numerous tributaries a much larger area. The eastern rivers descend from the high land through magnificent gorges, forming a succession of rapids and cascades, the falls in some instances having a descent of 500 feet. There are few lakes of any size as yet known to explorers; one of the largest is Lake Alaotra, measuring 25 miles in length, the others do not reach a length of 10 miles. A chain of lagoons linked by the Pangalane Canal, forms a waterway a short distance inland from the eastern seaboard, extending from Foulpointe to Farafangana (390 miles).

Géologically the elevated region consists almost entirely of granite and other igneous rocks, while the lower region is composed chiefly of secondary formations. The former region is traversed by a line of extinct volcanic craters, some of which show signs of comparatively recent activity. Among the more remarkable fossils are remains of a huge struthious bird, the Aepyornis, whose egg, measuring 12 by 9 inches, is larger than that of any other known bird. Minerals include copper, nickel, lead, iron, gold, large deposits of high carbon content graphite, mica, and numerous precious and semiprecious stones. Coal is found in the west both in the northern and southern parts of the island.

Climate.—The climate is varied; the heat on the coast is often very intense, but on the highlands of the interior the temperature is moderate. The coastal climate is tropical. In the interior the winter is dry and agreeable. The greatest amount of rainfall occurs on the east coast, and especially on the northeast, the part directly exposed to the summer monsoon. The elevated region of the interior and the districts on the west coast are more suitable for Europeans, but owing to the large extent of marsh and lagoon on the east, malarial fever prevails, and is frequently fatal to natives from the interior as well as to Europeans. On certain days in August or September, there may be freezing temperatures in high plateaus but snow is unknown.

The People.—The inhabitants, known by

The People.—The inhabitants, known by the name of Malagasy, belong to the Malayo-Polynesian stock and speak a Malayan languge. They appear to form substantially a single race, though they have received a considerable intermixture of African blood and a certain amount of Arab intermixture. They are divided into numerous tribes, each having a distinctive name and custom. The Antaimerina (commonly called Hovas) are the predominant tribe; their proper country is the elevated region of the interior, but they extended their sway over nearly the whole island. They were socially divided into three classes: And iana or nobles; Hovas (in a special and restricted use of the word) or free commoners; and Mainty or slaves. The nobles and slave classes have been abolished by the French. Among the other chief tribes are the Betsimisaraka on the east coast, the Betsileo in the south central region, and the Sakalava on the west and north. In the coast districts the houses of the better class are built of framed

timber with lofty roofs covered with shingles or tiles; the dwellings of the lower classes are constructed of bamboo or rushes, even of clay In former and more unsettled times the villages were almost always built on the tops of hills, but during the 19th century this precaution was not deemed so indispensable. The principal article of native dress with both sexes is the lamba, a piece of cloth about three yards long and two broad, which is folded around the body under the arms, one end being thrown over the shoulder

Flora and Fauna.—The most striking feature in the vegetation was formerly a belt of dense forest on the east and west of Madagascar But forest areas greatly decreased during the last century, the high plateaus in particular being almost denuded. There is some virgin forest in Maroansetra and conservation measures are enforced. The stands include many species of lofty palms, hardwooded exogens supplying a great variety of beautifully veined and durable timber, and a large number of trees remarkable for the splendid character of their blossoms. Of all the trees of Madagascar, the most striking is the Ravenala or traveler's tree (R madagascariensis). It resembles a palm, its stem being crowned by a semicircle of oblong leaves spread out vertically in a fan shape. It owes its name to the fact that the traveler may supply himself with water by piercing or breaking the lower ends of the leaf stalks.

Madagascar has a singularly local fauna which, although upon the whole related to Africa, is so peculiar to itself that, with a few neighboring islets, it forms a very distinct sub-province of the African region. Its characteristics show plainly that the separation of the island from the continent occured at a very ancient time. Another singular feature is the presence of various forms of animal life represented elsewhere only in Oriental Australian regions; in a few animals, there is a marked resemblance to South American species (for example, the boas). From this fact it has been argued that in early Tertiary times there was a land con-nection between Madagascar and India and the region thence to Australia, now presented only by the islands of the Malayan Archipelago. (See LEMURIA) In its mammals, Madagascar is singular in what it lacks, as well as in what it possesses. It has none of the cattle, equine animals, elephants, rhinoceroses, hogs, or even rodents of Africa, except a mouse or two; no lion or true cat or dog of any kind; and no monkeys. On the other hand, it has several small insectivora, closely allied to tropical American species; the great majority of all the lemurs, the few outsiders being in Africa and the Orient; and several viverrine quadrupeds, which take the place of the predatory cats. The modern birds are less striking in their peculiarities, but in the zoological era immediately preceding the present, the island possessed those huge ratite birds, the Aepyornis and its relatives, which gave rise to the story of the roc. Many forms of huge land tortoises were also members of this singular fauna. The fishes, amphibians, reptiles and lower forms are largely peculiar.

Crocodiles are numerous in the rivers and lakes, and many species of lizards, chameleons and tree frogs abound in the forests. Among the insects are numerous brilliantly colored beetles, butterflies, moths, flies, locusts, and spiders, venomous species of the latter as well as

scorpions and centipedes being present See also ZOGGEOGRAPHY

Agriculture.—About 75 per cent of the 4,000,000 Malagasy inhabitants are farmers Of the vegetable products grown for food, by far the most important is rice, the staple food of the country; next in importance come manuoc or cassava, sweet potatoes, beans, tomatoes, groundnuts, and yams. Ginger, pepper, and indigo grow wild in the woods; cotton, sugarcane, coffee, tobacco, and hemp are cultivated. Humped cattle are found in immense herds, and form a large part of the wealth of the inhabitants, they appear to have been introduced from Africa at a remote period, as the fat-tailed sheep, goats, swine, and horses have been more recently Under French administration agriculture and cattle raising have undergone considerable expansion, An important part has been played in the settlement of the island by colonists from France. Cattle breeding is especially important. About 1,500,000 hectares of land are under cultivation (1 hectare=2.471 acres).

Industry and Trade.—Graphite, rassia siber, coffee, manioc, hides, sugar, cloves, vanilla, mica, and canned meats are exported. The chief imports are cotton goods, machinery, iron and steel, cement, fuel oil, and automobiles. Imports for 1946 were 1,352,000 tons valued at 2,121.6 million francs C.F.A. Exports: 132,900 tons valued at 2,777 millions. Mineral exports: 8,900 tons of graphite, also mica and quartz. Other exports included meat and manioc. Phosphate production ceased in 1939. Production of garnet and corundum for abrasives, and rock crystal used for optical supplies, has continued, but exports of precious and semiprecious stones were curtailed by World War II. In general, the Malagasy show much aptitude for the manual arts. As silversmiths, gunsmiths, carpenters, and shoemakers, they rapidly acquire the skill of Europeans. They also make hand-woven textiles, rabanna goods, fine lace, straw hats, and ceramics.

Transportation and Communication.—There are two main railroads on the island. One extends from Tamatave to Tamanarive, 230 miles, with one branch line from Tananarive to Antsirabe, 98 miles, and another from Moramanga to Lake Alaotra, 105 miles. The second is the Fianarantsoa-East coast line, 100 miles in length, serving the Betsileo region. There are approximately 15,500 miles of roads on the island, and a network of local airlines, mail being carried by plane.

Government.—Madagascar is divided into five provinces and is administered by a high commissioner assisted by a government council. French decrees of October 1946 (modified in January and March 1947) instituted a Representative Assembly consisting of 36 members—15 comprising French citizens of the first electoral list, which includes some autochthonous voters; and 2l, the second electoral list comprising Malagasy who do not have French citizenship status. Five provincial assemblies were established, elected on the basis of the double lists, with representatives of the second list in the majority. The provincial assemblies clect the members of the Representative Assembly. The elections of March 30, 1947, returned to the Assembly (for the second electoral list) 12 members of the Parti des Déshérites Malgaches (favoring close ties with the French), and 9 of the

Democratic Movement of the Malagasy Renovation (desiring a free and independent Madagascar within the French Union). A Court of Appeal and tribunals throughout the provinces provide for native justice, while there are special courts for the administration of French justice.

Education and Religion.—In 1944, there were more than 250,000 children attending public and private elementary schools where the curriculum comprises academic and technical courses. Education is free and compulsory, and instruction in French is obligatory. Instruction is also given in higher schools in practical agri-Numerous culture, industries, and medicine Catholic and Protestant missions and mission schools have long been established; in 1895 it was estimated that there were 450,000 Protestants and 50,000 Catholics in Madagascar The religion of the great bulk of the people is a kind of fetishism or worship of charms

History.-Madagascar was known to the traveler Marco Polo at the end of the 13th century and had already been visited for several centuries by the Arabs. In 1506 it was visited by the Portugese, who gave it the name of St. Lorenzo. A number of French settlements were formed, broken up, then re-established at various times, more particularly along the east coast at Sainte-Marie Island, Antongil Bay, Fort Dau-phin, and Tamatave. British influence began to

be felt after the Napoleonic wars. Previous to 1810, Madagascar, which had no truly indigenous population, might be said to be divided among numerous tribes who remained almost constantly at war with one another. By the 19th century, the Hovas had gradually extended their supremacy over most of the island. While some of their rulers encouraged the in-filtration of European ideas, others yielded to the pressure brought to bear by the Andriana nobles and gave proof of a fear and distrust of strangers which several times led to armed intervention by both the French and British. After several decades of rivalry, the British recognized France's larger interests and predom-

inant rights in the island.

Radama I, a prince of remarkable intelli-gence, became king of the Hovas in 1810, and began to enforce by right of conquest a claim to the sovereignty of the whole island. He received arms and other assistance from the British, by which he was enabled to carry on his conquests. Christian missionaries began to teach in the capital in 1820. Many converts were made, the Bible was translated into the Malagasy tongue, the language was first reduced to a systematic written form, and printing was intro-duced. Great improvements had taken place in the manners of the people when Radama died in 1828, and was succeeded by his chief wife, Ranavalona I, a woman of cruel disposition, and opposed to all innovation. The native converts were persecuted, many of them being put to death, and the island was closed to Europeans. This reign of terror ended at last in 1861, when the queen died, and was succeeded by her son, Radama II, who, himself a Christian, reopened the island to European missionaries and traders, and proclaimed the emancipation of the African slaves. He appears, however, to have been a weak prince easily swayed by native and foreign favorites, and he made an unwise grant of extensive territories and privileges to an enterprising French company, an act which lost him the

affection of his nobles, and led to his assassination in 1863. His wife Rasoherina was placed on the throne, and the government repudiated the concessions made to the French, offering 1,000,-000 francs as compensation. After a quiet and prosperous reign of five years, this queen died, and was succeeded by Ranavalona II in 1868. After she had been elected queen, she and a great number of her courtiers became Christians, and many reforms favorable to enlightenment and humanity were perseveringly carried out. was succeeded in 1883 by Ranavalona III. Sakalavas, a large tribe inhabiting the northwest of Madagascar, had previously asked to be placed under France's protection Queen Ranavalona refused to recognize French interests in that part of the island and this led to hostilities in 1883-1885. The war was terminated by a treaty, under which France acquired protectorate rights over Madagascar, but hostile feeling to-ward the French again led to war in 1895. Franch forces soon quelled the insurrections and Madagascar was proclaimed a French colony (Aug. 6, 1896). In 1897 the queen was deposed and exiled, first to the island of Réunion and thence to Algiers where she died in 1917 Joseph Simon Gallieni was named French resident general (1896-1905) with full military and civil powers. He removed Hova governors from all regions inhabited by other tribes and rapidly

brought peace to the island.
In 1941, fears were aroused in Great Britain by Japanese official statements concerning the possible occupation of Madagascar by Axis forces. A British expeditionary force established a control zone in Diégo Suarez, May 1941. Five months later they took control of the whole island, the pro-Allied French officials continuing their functions. In December 1942, the French Committee of National Liberation appointed a high commissioner for Madagascar and French

sovereignty was restored.

Consult Howe, S. E, Drama of Madagascar (London 1938), Griffith, G, and Ronca, J, Madagascan Adventure (London 1939), Chapman, O. M., Across Madagascar (London 1943).

JEAN DE LA ROCHE, French Colonial Administrator.

MADAME BOVARY. The first and bestknown novel of Flaubert, a type and model for the fiction of the next generation, was the first and is probably still the best of minute reproductions of the platitudes of modern life. Madame Bovary was published in 1856 when Flaubert was already 35, the fully matured and laboriously executed expression of his effort to make writing a means of emancipation from self. The French literary historian Gustave self. The French literary nistorian Gustave Lanson considered it "the masterpiece of contemporary fiction." Flaubert's own education had been out of key with his provincial surroundings, and he chose natures similarly out of tune with their environment for the first object of his study, with a painstaking accumulation of "significant little facts" quite in the spirit of Tayra's psychology and literary the spirit of Taine's psychology and literary criticism. Flaubert had worked on Madame Bovary at least since 1852, "eighteen hours out of the twenty-four," he tells George Sand, and adds, "I seek something better than success, I seek to please myself." The novel attracted immediate and wide attention, presently stimulated by a prosecution of the author for alleged immorality, a celebrated case, ending in a curiously qualified acquittal. The court pleadings and judgment, printed at Flaubert's instance with subsequent French editions of the novel, throw strange light on the moral ideas of the last decade of the Second Empire.

'Madame Bovary' marks the transition from the fiction of romantic fancy to that of close realistic observation, preferably of the petty, the puerile and the commonplace. The theme is the banality of provincial life, as Flaubert saw and felt it; the lesson is the futility and danger of a sentimental revolt from the commonplace when vulgar souls indulge in romantic aspirations. Briefly the story is this: Charles Bovary, a "medical man," though not an MD, fatuously good, timidly banal, is shown us first as a dull pupil, then unsympathetically married, then a widower attracted to a farmer's daughter, Emma, the book's chief subject, whom he marries, apparently the less initiated of the two. Emma's convent education beyond her station had been supplemented by romantic poetry and fiction, in Flaubert's opinion a deliberate perversion, whose degrading and immoral results he proposes to show. Charles was happy; Emma ever restlessly reaching out toward a fulfilment of her romantic aspira-tions. Chance brought her to an aristocratic tions. Chance brought her to an aristocratic ball. Dormant emotions were awakened. "She desired at the same moment to die and to live in Paris, Léon, a law student, served her for a platonic attachment, presently to be suc-ceeded by Rodolphe, after Emma had sought sentimental consolation in religion, quite in vain. Rodolphe's carnally-minded courtship, a bitterly ironically parody of romanticism, is successful; but from dreams of bliss Emma is relentlessly drawn down to and below the commonplace. Both weary, Emma again seeks refuge in religion, but meeting the now more sophisticated Léon yields once more, and plunges Charles into debt while still seeming to him more charming than ever, as she descends the last steps of dissimulated corruption Abandoned by Léon, once more rejected by Rodolphe, she escapes life by poison, holding even beyond death the infatuated love of Charles, who, even though at last undeceived, dies with a lock of her hair in his hand.

Incidental to the story are some admirable character studies of provincial types, notably M. Homais, druggist-demagogue and material-ist, incarnation for Flaubert of "triumphant democracy," a by-word for the narrow, provincial philistine, who has given his name to a social species. His counterfoil is the parish priest, Bourrisien, whose cure of souls is a perfunctory, well-meaning, uncomprehending fatuity. More subordinate but strongly individual are the sacristan Lestiboudois, the notary Guillaumin, and the merchant-money-lender

Lhereux.

Apart from its subtle psychology 'Madame Bovary' won and holds admiration for its phrases of flashing irony, its vivid narration and fine descriptive passages, but no less for its linguistic euphony, a matter to which Flaubert gave untiring and at times almost morbid attention. Ethically it reflects its author's sombre pessimism. To Flaubert all spiritual aspiration seems foredoomed to failure. For himself he sought forgetfulness in the pursuit

of art for art's sake In this book he presents neither a character to imitate nor an act to admire Yet 'Madame Bovary' is, in Bouiget's phrase, "the very ideal of the literary artist" There are translations by W. Walton and others. Consult Whitchouse, H. R. 'The Life of Lamartine' (2 vols, New York 1919).

BENJAMIN W. WELLS,

Author of (Modern Prench Literature)

MADAME SANS-GENE. (1) The wife of Marshal Lefebvre, a laundress at the time of her marriage to the Marshal (then a scregant), who was given the name, which means "carefree," because she retained the unconventional manners of her early life. (2) A play by Sardou and Moreau, first presented at Paris in 1803. The personages are Napoleon and the 1893. The personages are Napoleon and the homely characters whom he made his courtiers. (3) An opera, first presented at the Metropolitan Opera House, New York City, 25 Jan. 1915.

MADDER, (1) in botany, the English name of the plants of the genus Rubia, especially R. tinctorum It is a trailing or climbing annual, supporting itself by its leaves and prickles It is supplied chiefly from Holland, France, Italy and Turkey The roots are kilndred and then threshold they are then draded dried and then threshed; they are then dried a second time, and afterward pounded and stamped in a mill Indian madder, called also madder of Bengal, is R cordifolia (2) In chemistry, the root of R tinctorum is extensively used in dyeing for the production of a variety of colors, namely, red, pink, puiple, black and chocolate Other species of Rubia are also used. It would appear that madden are also used. It would appear that madder contains a colorific principle—rubian—which, under the influence of a peculiar ferment, termed erythrozym, breaks up into alizarin, purpurin, etc The colors produced from madder are very stable, the well-known Turkey-red being one of them. Madder also contains certain relieve to the colories but they are received. yellow coloring matters, but they are useless, if not injurious, in the process of dyeing. (See Dyes; Dyeing) (3) In pharmacy, madder is a tonic, diuretic and an emmenagogue. Brown madder, a rich red-brown pigment, prepared from the roots of R tinctorum

MADDOX, Richard Leach, English physician and chemist b. Bath, England, 4 Aug 1816; d Portswood, Southampton, 11 May 1902 He studied medicine at University College, London, but was graduated MD at Edinburgh In early life he settled and practised his profession in Constantinople, and here first took up the study of photography. He subsequently left the Bosphorus for Smyrna and was a civil surgeon in the military hospitals at Scutari during the Crimean War, and finally settled at Woolston, near Southampton, England. It was during his residence at Woolston, which lasted until 1874, that he worked out the process which has revolutionized the art of photography, by substituting the gelatino-bromide for the collodion plate. With him originated the gelatino-bromide dry plates to take the place of the wet collodion plates which, besides other inconveniences, sometimes produce an atmosphere which is dangerous to the operator's health. There have been more than one claimant to the credit of this discovery, but it has been decided by the Scientific American that Dr. Maddox is entitled to all the honor of the

MADEIRA, ma-dē'ra (Port. mā-dā'ē-ra), group of Atlantic islands belonging to Portugal, opposite to and about 360 miles distant from Morocco, on the west coast of Africa and about 535 miles southwest of Lisbon Madeira, the principal island, and the islets of Porto Santo, Dezerta Grande and Bugio, comprise the group with an area of 314 square miles, and a population of about 211,000. The main island (area, 300 square miles) consists of a collection of mountains of volcanic origin, the most elevated of which is upward of 6,000 feet high Through the west half of the island runs a central ridge about 5,000 feet high, on which is an extensive plain called Paul de Serra. The east portion of the island, though elevated, is less so than the west From the central mass steep ridges extend to the coast, where they form percendicular presures of where they form perpendicular precipices of from 1,000 to 2,000 feet high. These cliffs are indented by a few small bays, where a richly cultivated valley approaches the water between abrupt precipices, or surrounded by an amphi-theatre of rugged hills. These narrow bays are the sites of the villages of Madeira. The most striking peculiarity in the mountain scenery of the island is the jagged outline of the ridges and the deep precipitous gorges which cut through the highest mountains almost to their very base. The road round the island is in many places exceedingly picturesque, being led often between lofty cliffs or along the front of precipices overhanging the sea. The Madeiras were known to the Romans under the name of Purpurariæ Insulæ. They were rediscovered by the Portuguese in 1420, and the name Madeira was given to the principal island from the magmission forests of building timber (in Portuguese madera) which then covered it It was settled by the Portuguese in 1431 From 1580 to 1640 the islands, with Portugal itself, were under Spanish the British for Emphal the 14) been under the British flag Funchal, the capital (pop. 24,687), is an episcopal see. The inhabitants are devout Roman Catholics. The mean annual temperature of Madeira is 65° and the climate, from its constant and temperate warmth, is well known for its favorable effects on those suffering from pulmonary and other complaints, which renders the island a favorite resort of invalids from Great Britain and elsewhere. Large and well-appointed hotels exist at Funchal The islands are connected with Great Britain, France and Belgium, and With the United States, by steamship lines The staple product of Madeira is wine, the quantity of which in good years prior to the appearance of the vine disease in 1852 amounted to 2,750,000 gallons

The annual export is now about 700,000 gallons. Sugar-cane, and the cactus for the rearing of cochineal, are cultivated, fruit and vegetables are grown, fishing is actively engaged in, linen, woolens, leather, straw hats, baskets, soap, sugar, spirits, butter, etc, are manufactured. The chief import is coal, the most important of the others being wheat, rice, Indian corn and dry goods.

MADEIRA, or CAYARI, Brazil, a large navigable affluent of the Amazon, about 800 miles long, formed by the united streams Beni and Mamore on the frontiers of Brazil and Bolivia The length from the source of the Mamore is 2,000 miles.

MADELEINE, Marie Angélique, DE SAINTE, French abbess, prioress of the convent of Port Royal, Paris See under baptismal name, Arnauld, Jacqueline Marie

MADELEINE, mad'lan', La, France, a prehistoric station in the valley of the Vézère, midway between Moustier and Les Eyziès. The Madelenian, or Magdalenian, Epoch was named from this cave by the French anthropologist, Gabriel de Mortillet.

MADELEINE, mad-lān, La, a church in Paris, in a square of the same name, commenced in 1764 It was remodeled and changed after the Revolution, and in 1832 was completed at a cost of \$3,000,000 The church is built in the form of a Roman temple and is 100 feet high, 354 feet long and 141 feet wide The bronze doors by Triqueti are 35 feet high and 16 feet in width The building, which has no windows, is lighted from above.

MADEMOISELLE DE MAUPIN, mō'-păn': 'Mademoiselle de Maupin,' a novel written by Théophile Gautier when he was only 24 years of age (1835), expresses the most salient features of romanticism. In the somewhat long preface is found the key to the interpretation of this highly imaginative work. Gautier cries out against the shammed respectability of that pe-riod and condemns the prudish stand of literary critics who according to him are merely hypocrites actuated by envy. Violently opposed to classical traditions and ideas, Gautier, who had been trained as a painter, keeps in this work the painter's vision, and emphasizes primarily form and color, while defending art for art's sake. Digressions on the supreme value of beauty are found frequently throughout the pages, and the vivid imagination of the author is fruitful to the point of exaggeration. The herome, brought up according to tradition, rebels against it, and, disguised as a man, like the Amazons of old, resolves to study life at first hand After many unusual adventures she becomes for one day the long-sought ideal of a romantic poet who had searched in vain until then for the "woman" of his dreams and who found her only to lose her immediately. As a novel the work is crude both in subject matter and in development, showing that it comes from a young man whose passions were not yet calm. It is, however, essentially artistic; the style is full of color and abounds in beautiful descriptions and lyric passages While the novel did succeed in amazing placid citizens and is still classed as dangerous reading, it must not be considered as a study of any type of French character, but as a flight of imagination, a descriptive fantasy artistically worked out by a talented writer of the Romantic school.

Louis A. Loiseaux.

MADERA, Calif., city and Madera County seat; alt. 272 feet; 22m. NW. of Fresno; on the Santa Fe, and Southern Pacific railroads. It is in a lumber, and vineyard area. Pop. (1940) 6,457.

MADERO, ma-dā'rō, Francisco Indalecio, President of Mexico: b. San Pedro, Coahuila, 18 Oct. 1873: d. Mexico City, 23 Feb 1913. He came of a wealthy family and was a grandson of a former governor of Coahuila. He was educated at a Jesuit college in Mexico and at the University of California and spent the years

1889-95 in France. He returned to Mexico, engaged in cotton-planting and in banking and materially increased his fortune. He took up his residence in Mexico City in 1900 and be-He took up came keenly interested in political reform a naturally returned disposition, he displayed an initiative that surprised his most intimate friends, and by 1905 he was the unquestioned leader of the reform element. He actively opposed the rule of Diaz, and in 1908 he published his 'La Sucessón Presidencial en 1910,' a strikingly well-balanced attack on the evils existing in the political and social life of Mexico He advocated suffrage reforms, a single term for the Presidency and opposed the absolutism which characterized the rule of Diaz, while crediting him with the many achievements of his administration. The book caused a sensation and was promptly suppressed by the government. However, Madero was nominated for the Presidency in 1910, running against Diaz on a platform advocating a single term for the Presidency. He was arrested on a fabricated charge in July 1910 and imprisoned until it was too late for him to interfere with the re-election of Diaz. Madero then headed a plot for a revolution against the government, advocating reforms in suffrage, land distribution, freedom of the press and the single presidential term among other measures. The uprising began at Puebla, 20 Nov. 1910, spread through Sonora and Sinaloa, and upon capturing Juarez, Madero set up his government and appointed a cabinet, 11 May 1911. The Diaz government then entered into a conference with the revolutionists and peace was declared 21 May. Madero was elected President 1 October. Temperamentally a dreamer and idealist, Madero found himself checked upon every hand in his attempts to carry his projected reforms into effect. He was unable to manage the politicians of the old régime, or the insurgent element, and in 1912 revolts broke out under Zapata in the south and under Félix Diaz, nephew of ex-President Diaz, in the north He was charged with being slow and irresolute in his administration of public affairs, of favoring his relatives and of personal peculation from the public treasury. The Diaz revolution was suppressed and General Diaz was imprisoned. Madero, however, was of a forbearing disposition and suspended the death sentence pronounced against the revolutionist. An uprising among the soldiers in Mexico City took place 9 Feb. 1913 and released Diaz and another enemy of Madero, General Bernardo Reyes. The Federal troops for a time resisted the revolutionists but on 17 February General Blanquet with a force of 1,200 arrived in the city and joined General Huerta, Madero's commander-in-chief, in over-throwing the government. Madero was ar-rested and imprisoned 19 February and plans for his exile were under way when it was decided to bring him to trial. Together with the Vice-President, Pino Suarez, Madero was being conducted from the National Palace to the penitentiary when both were shot. No reports except those of the government were available and the official version was that an intervention in behalf of the prisoners was made by Madero sympathizers, whereupon the prisoners attempted to escape and were shot. Huerta was generally held responsible for their deaths and was eventually forced from office because of

them although he persistently denied complicity in the affair

MADHAVA, ma'dha-va, another name of the Hındu god Vishnu (q v)

MADIA OIL, oil expressed without heat from the seeds of Madia sativa. It is trans parent, yellow, odorless and may be used on the table as a substitute for olive oil or for oil-cake for cattle. The plant is a composite, native to southern South America, but has long been cultivated in Europe for its oil-bearing seeds.

MADISON, James, American Protestant Episcopal bishop. b Rockingham County, Va. 27 Aug. 1749; d 6 March 1812. He was graduated at William and Mary College in 1772 studied law and was admitted to the bar, but soon after abandoned law for divinity. In 1773 he was chosen professor of mathematics in William and Mary College, and in 1775 went to England and was admitted to orders by the bishop of London. In 1777 he was elected president of the college, and during the American Revolution succeeded in keeping the college in active operation. Having been chosen as bishop of Virginia he was consecrated by the archbishop of Canterbury, in Lambeth Palace, 19 Sept. 1790. He continued to discharge the duties of president of the college and professor of natural and moral philosophy, international law, etc., with those of the episcopate, until his death. His only publications were several occasional discourses and a 'Eulogy on Washington' (1800).

MADISON, James, fourth President of the United States: b. Port Conway, Va., 1751; d. Montpelier, Va., 28 June 1836. Madison was the eldest son of James Madison, a Virginia planter, and of Nelly Conway, daughter of Francis Conway, of King George County, Va His father, a man of independent means, lived on an estate now known as Montpelier in Orange County. James was born at Francis Conway's home on the Rappahannock while his mother was on a visit to her parents. His educational advantages were excellent for the times; he attended the school of a Scotchman, Donald Robertson, was well prepared for college by the clergyman of the parish, the Rev. Thomas Martin, and entered Princeton in 1769 His application to his studies was excessive, and was in part the cause of later ill health; he succeeded, however, in taking the studies of the last two years in one year and took his B.A. degree in 1771. He remained at Princeton for another year doing special work in Hebrew under Dr. Witherspoon, the president. After his return home he tutored his younger brothers and began a systematic course of reading in theology, philosophy and law. At this time his study of Hebrew and theology seem to indicate a desire to enter the ministry, but he soon abandoned this and prepared himself for the legal profession and for public service. His theological studies bore good fruit later as is evidenced by the stand he took for religious liberty.

Madison was by instinct a politician and not

Madison was by instinct a politician and not a soldier; he took no active part in the Revolutionary War, but as early as 1774 he was appointed a member of the Committee of Public Safety for Orange County, and in 1776 was elected delegate to the convention which framed the constitution of Virginia. From that time

until he retired from the Presidency he was honored with high public offices by his State and by the nation. In the Virginia Convention Madison succeeded in substituting for a clause in the Bill of Rights permitting the "fullest tol-eration" in religion, a clause allowing the "free exercise of religion" This was a distinct blow to religious intolerance for, as he said, toleration implies jurisdiction, and the State should have no coercive power over religious thought. He was a member of the first Virginia assembly but failed of re-election because, as his biographer Rives tells us, he refused to conform to the universal custom of his day and "treat" his constituents; he was, however, made a member of the governor's council and so distinguished himself that in 1780 while still under 30 he was chosen as delegate to the Continental Congress. In this Congress he was conspicuous for his opposition to the issuance of paper money by the States; for his efforts to secure for Congress the right of taxing imports, and for his determined stand to retain for the States the right of navigation on the Mississippi Madison saw clearly that a government so organically weak that it could not enforce its requisitions and could pay its debts only by increasing its debt could never be effective; hence he labored unceasingly to en-large the power of the central government The office of delegate was limited to one term, so Madison was not returned to Congress in 1784, but the high esteem in which he was held was shown by his immediate election to the State Virginia was a very influential assembly. State and her attitude toward national questions was of great importance. In the assembly Madison tried to indoctrinate the people of Virginia with his ideas concerning the Federal power. His bill to regulate trade in Virginia and to provide ports of entry led first to the conference between Virginia and Maryland with reference to trade on the Potomac and later to the Annapolis Convention which met in 1786 to consider the trade and commerce of the United States. This Convention at Annapolis urged upon the States the appointment of commissioners to meet in convention at Philadelphia "to devise such further government as shall appear to them necessary to render the Constitution of the Federal Government adequate to the exigencies of the Union." The summoning of the Philadelphia Convention was largely due to the wise bills introduced by Madison in the Virginia assembly and to his direction of public sentiment, and it was eminently fitting that he should be one of the delegates of the Vir-ginia Commission at whose head was George Washington. Madison's views on government are clearly defined in his "outline system" which formed the basis of the Virginia plan proposed to the Convention. His system demanded that there should be a due supremacy of national authority without the exclusion of local authority. ity, that the national authority should extend to the judiciary and to the militia; that the national legislature should be composed of two bodies, the larger elected for a short, the smaller for a longer term; that Congress should have certain coercive powers; that a national executive should be provided and that the basis of representation in Congress should be changed from States to population. The "Virginia plan" was the germ of the Constitution and Madison is

rightly called the "Father of the Constitution." His arguments in favor of the proposed government were exhaustive and convincing, and his private notes of the work of the Convention and of his debates purchased from his widow and published by Congress form a valuable addition to our knowledge of this stormy period. While the Constitution was before the people for consideration Madison, Hamilton and Jay wrote a series of papers called in collected form The Federalist, in which they discussed government in general, defined the character of the proposed union, met objections and proved the advantages to be derived from effective central government Madison was a member of the Virginia Convention which met to consider the ratification of the Constitution and by his keen analysis and clear-cut argument contributed more than any other man to secure its adoption His chief opponent was Patrick Henry; his ablest ally, John Marshall Owing to Henry's antagonism, Madison was defeated as candidate for the Senate, but was elected as representative to Congress and took his seat in April 1789 During this session of Congress, Hamilton and Madison, who had hitherto been as one in their efforts to centralize power, drifted apart, and Madison gradually began to endorse Jefferson's position as to certain inalienable States' rights. There is no reason to accuse him of bad faith; his statesmanship was never overbold, and Hamilton's commercial system, his extensive financial schemes, especially the funding of the national debt and the assumption of State debts by the general government, gave so much power to Congress that Madison withdrew his support from the Secretary of the Treasury and vigorously opposed his measures. Although Madison had now definitely cast in his fortunes with the Republican opposition his moderation and good sense enabled him to retain the friendship of most of his political opponents.

From 1793 to 1796 the country was greatly agitated over the relation of the United States toward France, and on the outbreak of war between France and England the President issued a neutrality proclamation to the great disgust of the French, who had expected active friendship from the United States. Although both countries interfered shamefully with American commerce, popular sentiment and the Republican party sided with France. In 1794 Madison, supported by Jefferson, introduced a bill demanding retaliatory measures against Great Britain, and a temporary embargo was laid on British commerce. The signing of the Jay treaty by the President was a signal for an outburst of popular indignation, and Madison, as leader of the opposition in Congress, opposed the appropriation of money to carry out the terms of the treaty. In 1797 Madison retired and enjoyed for a short while the pleasures of private life. A year later he was aroused to activity by the passage of the unpopular Alien and Sedition Acts. The Virginia resolutions written by Madison denounced these laws and declared that in case of a dangerous exercise by the Federal government of powers not granted by the compact the States had the right to interfere. These resolutions still further emphasized the position of the Republican party and pledged it to the support of States' rights. The year 1801 brought an overwhelming defeat to the Federalists; Jefferson was inaugurated President and

Madison became Secretary of State. He was thoroughly in sympathy with the President's views and shared the popularity of that brilliant administration. The last years of Jefferson's second term were clouded by the insulting actions of England and France with reference to the American navy. The orders of the British and the decrees of Napoleon concerning the seizure of neutral vessels were ruining American commerce. Vessels were seized by the English and by the French, American seamen were impressed and ports blockaded. Jefferson was opposed to war and in his efforts to coerce France and England by commercial restrictions he induced Congress to lay an embargo on Brit-ish trade. Instead of injuring England this seriously crippled American commerce and was soon repealed In this troubled condition of affairs Madison became President in 1809 Like Jefferson he was opposed to war and tried diplomacy. He attempted through Erskine, the British envoy, to have the British Orders in Council withdrawn. Erskine agreed, but the British government repudiated the action of its envoy. Negotiations with another British Minister, James Jackson, were also fruitless Continued insults were heaped upon American ships and men; the country demanded definite action against the aggressors; even the peace-loving President, weary of the offensive attitude of England, at last gave his consent to war On the 18th of June 1812 war was declared and continued with varying success until the Peace of Ghent in 1814. After nearly three years of fighting, after ruinous loss of money and property, the country was practically just where it stood in 1812, "its boundary unchanged, its international rights still undefined, the people still divided." Madison lacked vigor as a war President, nor had he sufficient determination to secure advantageous terms of peace. He was far greater as a framer of the Constitution than

as an executive.
In 1817 Madison retired from office and settled on his estates of Montpelier. He had married in 1796 Mrs. Todd, afterward the celebrated Dolly Madison, and with her he enjoyed 20 peaceful years in his country home. He was interested in farming, he thought and wrote much on all topics of public interest. He discussed social and moral questions, slavery and education. "Education," he maintained, "was the true foundation of civil liberty." The last public appearance of the venerable statesman was in the Virginia Convention of 1829 which met to amend the State constitution In character Madison was thoughtful, reserved and cautious; in a time of hard drinkers he was notably abstemious. Moderation characterized all his habits. Dignified and kindly and an excellent conversationalist among those he knew well, he made and retained warm friends. His knowledge was profound and accurate, and he was considered an authority on all constitutional matters. His literary style was labored, but his arguments were keen, comprehensive and con-

vincing.

Consult Lives of Madison by J. O. Adams (1850); Rives (1859-68); Gay (1884); also (Letters and Writings of Madison) edited by Hunt (9 vols., New York 1900-10); Adams, Henry, (History of the United States from 1801 to 1817) (1889-90). Consult also Hunt G., (Life of James Madison) (New York 1902);

Taylor, H., 'The Real Authorship of the Con-(Washington 1912); Wilson, J. G., 'Presidents of the United States' (Vol. I, New York

EMILIE MCVEA,

Late President, Sweet Briar College. MADISON, Lucy Foster, American novelist: b Kirksville, Mo, 8 April 1865. She was elist: b Kirksville, Mo, 8 April 1865. She was educated at the high school in Louisiana, Mo, and was married in 1890 to W. S. Madison She published 'A Maid of the First Century' (1899); 'A Maid at King Alfred's Court' (1900); 'A Colonial Maid' (1902); 'A Daughter of the Union' (1903); 'A Maid of Salem Towne' (1906); 'Peggy Owen' (1908); 'Peggy Owen at Yorktown' (1911); 'A Life of Joan of Arc' (1918); 'Life of Washington'; 'Story of Abraham Lincoln' (1927). D. 16 Maich 1932.

MADISON Ga enty and Moreon Country

MADISON, Ga, city and Morgan County seat, alt. 667 feet, on the Georgia and the Central of Georgia railroads, 70m. SE. of Atlanta. Its industries are cotton and lumber. It has airline scrvice; a mayor-council government; a public library, and a hospital. The city was named in honor of Pres. James Madison. Pop. (1930) 1,966; (1940) 2,045.

MADISON, Ill., village in Madison County; alt. 425 feet; on the Mississippi River; opposite St Louis, Mo., on Illinois Central and other railroads (freight). Madison, Granite City, and Venice, known as the Tri-Cities, are steel-mill cities. Merchants Bridge at Madison was built in 1890. Pop. (1940) 7,782.

MADISON, Ind, city and Jefferson County seat; alt. 460 feet; on the navigable Ohio River; 86m. SE. of Indianapolis; served by the Pennsylvania Railroad (freight only); and three airports. Situated in a region of dairy and poultry farms, it has food processing and packing plants. Tacks and rivets, laundry baskets and harmone would be a set of the set of hampers, work clothes, porch furniture, saddle trees, and women's shoes are manufactured. It has a city-county library, and the county historical society's museum. At Hanover, near by, is Hanover College, founded in 1827. Madison was a key point in the development of the state's transportation system. From Madison were built the first two «turnpike» roads and the first steam railway west of the Allegheny Mountains. The Lanier Memorial, maintained by the state, is the former home of James Franklin Doughty Lanier, banker and railroad promoter, who financed the state when politics blocked its military service during the Civil War. Pop. (1940) 6,923.

MADISON, Me., village in Somerset County; alt. 290 feet; on the Kennebec River; 35m. N. of Augusta; on the Maine Central Railroad. There is abundant water power and manufac-tures include woolen textiles, lumber, and paper Historic Old Point and Norridgewock are near by. There were some settlers here before the Revolution, and the village was incorporated in 1804. Pop. (1930) 3,036; (1940) 2,581.

MADISON, N. J., borough in Morris County; alt. 250 feet; 18m. W. of Newark; on the Delaware, Lackawanna and Western Railroad. It is a suburban residential borough; its only industrial establishments are the greenhouses in which Italian workers are employed and which give the borough the popular name of Rose City. The handsome and elaborate Municipal Building was a memorial to her son given by Mrs. Hartley Dodge, daughter of William Rockefeller. Madison is the seat of Drew University (see Drew Theological Seminary), and two miles away, at Convent Station, is the College of St. Elizabeth, a Roman Catholic college for women. The Morris and Essex Kennel Club holds an annual dog show at Madison. The borough was incorporated in 1889; its government is administered by mayor and council. Pop. (1940) 7,944.

MADISON, S. Dak., city and Lake County seat; alt 1,669 feet; 43m. NW. of Sioux Falls; on the Chicago, Milwaukee, St. Paul and Pacific Railroad. It is in an agricultural area raising livestock and grain, and has flour mills, grain elevators, hatchery, creameries, and packing plants Eastern State Normal School (coeducational) is here Lake Madison, two miles away, is a resort Madison was settled in 1875 and named for the Wisconsin city. Pop. (1930) 4,289; (1940) 5,018.

MADISON, Va., town and Madison County seat; alt. 395 feet; about 28m NE. of Charlottesville; in the eastern foothills of the Blue Ridge Mountains. The county was formed from Culpeper in 1792. The brick courthouse, built in 1829, replaces an earlier one of logs in which William Wirt (qv) began his practice of law in 1793. Pop. (1940) 281.

MADĪSON, Wis., capital and 3d largest city of the state, Dane County seat, and center of the University of Wisconsin, alt. 861 feet, sitthe University of Wisconsin, alt. 801 feet, struated in the south central part of the state, on the 1sthmus between lakes Mendota and Monona, and also on Lake Wingra; 82m. W of Milwaukee, on the Chicago and North Western; the Chicago, Milwaukee, St. Paul, and Pacific; the Illinois Central; and the Milwaukee Electric railroads. A network of modern state and federal highways with motor bus and truck transportation in all directions, and airports and airlines also serve the city. It is in an agricultural and industrial region which has dairying, diversified farming, and manufacturing. The life of the capital centers around government and politics, education, trade, and industry. Local industries include railroad shops, breweries, limestone quarries, meat packing, an extensive wholesale and retail trade, and manufactures of dry cell batteries, machine tools, farm machinery, tin containers, paper boxes, dairy and other food products, hospital equipment, and bottle caps. Government, state, municipal, and federal activities provide employment to several thousand local residents whose payrolls and other expenditures contribute much to the commercial life of the city. Madison is one of the leading educational centers of the United States. Its educational and cultural institutions embrace a splendid public school system, private and parochial schools, music and art schools, a Carnegie public library, the University of Wisconsin (see Wisconsin, University of), the libraries of the state, the Wisconsin Historical Society, and the Wisconsin Academy of Sciences; the museums of different local institutions and various cultural organizations. Maintained here also, in co-operation with the university, is a United States agricultural experiment station and a noted Forest Products Laboratory Among the other federal agencies in the city is a District Court. Madison, with its extensive lake frontage, splendid government, university, and private buildings, and numerous public parks, is one of the most attractive state capitals in the Union. The State House or Capitol, 434 feet long and 283 feet in height at the dome, begun in 1904 and completed at a cost of approximately \$8,000,000, occupies a commanding site near the heart of the city; the State House grounds embrace an area of 14 acres. Between Lake Mendota (area over 15 square miles) and University Avenue lies the campus of the university, with its many splendid buildings. The city has excellent recreational facilities and is a popular tourist center, and summer resort.

Upon the creation of Wisconsin Territory in 1836 the site of the present city was chosen for the capital and named Madison in honor of President James Madison. Settlers were soon attracted, it was incorporated as a village in 1846, connected with Milwaukee by rail in 1854, and chartered as a city in 1856. The beginnings of the state university date from 1849. The city has mayor and board of aldermen, and its water supply system is municipally owned. Pop. (1930) 57,899, (1940) 67,447. The regular population, a large percentage of which is of German and Scandinavian extraction, is augmented during the university sessions by several thousand students and in season by resort visitors.

MADISON BARRACKS, N. Y., United States military post in Jefferson County, on Black River Bay, within the town of Sackett's Harbor, and about one mile from Lake Ontario. The post occupies about 108 acres and possesses in addition a rifle range of 868 acres at Stony Point. It was established in 1813.

MADISON RIVER, a stream in Montana which has its rise in the Rocky Mountains, at an elevation of 8,300 feet. It flows north through Madison County and unites with the Jefferson Fork of the Missouri, at Three Forks. It flows through several picturesque valleys and deep cañons; its whole course is about 230 miles.

MADISON SQUARE GARDEN, a former building in New York City, occupying a block or square between Madison Avenue and Fourth Avenue, and 26th and 27th streets. It contained an amphitheater seating 20,000 people, and was popular for horse shows, dog shows, circuses and political and religious meetings. The building also contained a theater, concert hall, restaurant and roof-garden. It was razed in 1926, the New York Life Insurance Company building now occupying the site. A sports arena at 50th Street and Eighth Avenue now bears the name.

MADISONVILLE, Ky., city and Hopkins County seat, alt. 460 feet, on the Louisville and Nashville and the Illinois Central railroads, 125m. SW. of Louisville; also on state and federal highways. Coal mining, tobacco growing, and dairying are the county's principal activities. The government is mayor-council. There is a public library, also a city hospital. Completed projects with government assistance include a new high school with gymnasium, stadium, and workshops. The city was named in honor of Pres. James Madison. Pop. (1940) 8,209.

MADISONVILLE, Ohio, former village in Hamilton County, now absorbed by Cincinnati, and forming a residential suburb of that city,

MADLER, ma'dler, Johann Heinrich, German astronomer: b Berlin, 29 May 1794; d Hanover, 14 March 1874. He was educated at the University of Berlin He became a professor and one of the governing faculty at the Berlin Normal School and was associated with William Beer in an extended series of lunar observations. He was professor at the Observatory of Berlin in 1836-40, and from 1840-65 he was professor and director of the observatory at Dorpat, Russia. The superb equipment of the observatory enabled him to make observations with an accuracy never before attained and he now devoted himself principally to the fixed stars. He published a map of the moon in four sheets which surpassed anything then published, and which still retains a high reputation, in 1834-36. Author of 'Populare Astronomie' (1841); 'Die Centralsonne' (1846); 'Die Eigenbewegungen der Fixsterne' (1856); 'Allgemeine Selenographie' (1857); 'Geschichte der Himmelskunde' (2 vols, 1872-73), etc.

MADNESS. See INSANITY.

MADOC, măd'ok, Welsh prince, who, in consequence of some civil dissensions, went to sea with 10 ships, and 300 men, in 1170, and discovered America He made a second voyage to and from this unknown land, but finally was lost to the knowledge of his countrymen. The story is to be found in Lloyd and Powell's 'Cambria' (1584), and Hakluyt gives an account of the voyages in his collection. In Owen's 'British Remains' the legend is referred to. Later travelers have imagined that they had discovered traces of these early immigrants in different parts of the country, and we have had stories of white Indians and Welsh Indians, etc. (Consult Humboldt's 'Personal Narrative,' Book IX, note A). Southey made Madoc the subject of an epic poem. Stephens, in 'Madoc, an Essay on the Discovery of America in the 12th Century' (1893), asserts that the story of Madoc is a baseless fable

MADONNA IN ART, The. In the early days of Christianity the teaching of the Church was largely carried on by the medium of pictures; statuary was added later. The translation of the Bible was in Latin and examples of the book were produced in parchment manuscripts emanating from the monastery scrip-They were very few and therefore Hence it is not surprising that the clergy utilized the graphic abilities of their more talented members and other available artistic sources to portray biblical scenes in mosaics and wall paintings to impress on the minds of the populace (practically all illiterates) the teachings of their creed. The subjects to be treated were largely selected by the patrons (the clergy), and those subjects naturally were the ones most likely to appeal to the masses. The relation of Mother and Child viewed from the aspect of Divine Inspiration could not but be foremost of the subjects selected as most certain to gain popular attention and to reach the innermost sentiments of humanity. And, from the limner's standpoint, no theme could better enthuse and inspire genius to perfection of execution and the bringing forth of ecstatic pictorial expression. Again, admiration of a master's presentment of the subject obviously was cause of emplation of the subject obviously was cause of emulation

of contemporaries and future artists to produce, if possible, more inspired conceptions of the subject A natural sequence of these accumulated impulses was the prolific production and reproduction of the Madonna in as many aspects and forms as the differences in genius itself. Hence the innumerable examples of the lovely theme which have present existence No single subject has been treated so prolifically and from so many viewpoints as this of the divine Madonna. In order to bring within a limited space some intelligible review of such a vast and profound subject the examples are usually divided into different classifications according to the method of treatment of the theme, the different episodes of the entrancing story, etc Thus we get the Madonna "enthroned," the Madonna "in Gloria," and the "Annunciation," the "Nativity," "Adoration of the Magi," "Flight into Egypt," etc. The earliest depiction of the Madonna is a subject of controversy. Legend tells us Saint Luke, Evangelist, painted pictures of the Holy Virgin, and there are several extant drawings which are claimed to be from his pencil. The Viigin as orante, usually termed the "Intercessor," with arms outstretched in Oriental form of supplication, is most generally accepted as the first method of treatment as found in mosaics and on glasses of the 4th or early 5th century, some with the name "Maria" inscribed. An early Assyrian manuscript of the 7th century in the chapel of Venantius has such an orante depiction. On ancient Chiistian sarcophagi the representation of the Holy Virgin is very rare, but in the mosaics of Santa Maria Maggiore (middle of the 5th century) we have the Virgin and Child in medallions on the triumphal arch, and on the spandrils of the arch are the Annunciation, Presentation in the Temple, Adoration of the Magi, Journey of Christ with Mary and Joseph to Jerusalem Of about the same date is a painting seen in Saint Agnes catacomb, in which the Holy Virgin seated stretches forth her hands in prayer. By 736 the Iconoclasts created much destruction of all kinds of biblical depiction from Byzantine artists, but by 787 comes the revival and the Virgin again appears as orante, veiled and aged. In the early representations of the Virgin appears a golden background representing glory and majesty; this gives way later to back-grounds of the angelic host. With the advance or development of the Madonna theme Cimabue (13th century) produced the "enthroned" Madonna, and this great early Florentine master was soon followed with Guido's Siena picture of the subject. And with the arrival of these talented masters the Byzantine stiffness and prescribed rigid rulings of the Greek Church forbidding natural depiction disappears and the human form and garb take on the supple-ness of flesh and clothing It is the beginning of free and highly-developed art, and as such is usually the phase chosen as the first classification with which to deal with detailed descriptions of the theme of the Madonna in Art.

The Madonna Enthroned.—In its early conception the subject depicts the "Queen of Heaven" (Regma Cæli), seated in the sky, surrounded by the saints and angels. An early example is Simone's picture in the Siena Council Hall; the Virgin in Campo Santo, Pisa, is another. As Queen of Heaven, having homage

paid her, she is crowned first then veiled In this conception of the subject the throne is supposed to be a heavenly throne and symbolic of dignity and divinity Mary is usually garbed in a red tunic as symbol of love and with a blue mantle signifying Heaven. The Child is vested in a tunic till the 15th century, but then generally appears undraped The Babe generally holds up a hand in blessing, but in the 6th century mosaic of the enthroned Madonna in the Basilica of San Apollinare Nuovo, Ravenna, Mary raises her hand in blessing The first human figures we see around the throne are the saints, especially John Baptist, the Apostles and the patrons of the particular church to which the work of art is dedicated Saint John is represented as a child generally bearing a reed cross; at times, as messenger, he has wings Later patriarchs, prophets, sibyls are in attendance about the throne Wellknown examples are very many and but few can be mentioned That of Fra Bartolommeo (Baccio della Porta, 1469–1570) is in the Pitti Gallery, Florence; Andrea del Sarto's Madonna di San Francesco in the Uffizi Gallery there stands on a pedestal throne with harpies at its corners (hence sometimes termed "Madonna of the Harpies"). Luini's Madonna in the Brera, Milan, is seated on a coping. Perugino's Madonna (Vatican, Rome) is one of this master's best works and depicts the Virgin seated on a carved and inlaid architectural marble throne. Pinturiccio's Madonna in the chapel of Saint Andrea, Perugia, has the child Saint John standing at the throne's foot. Raphael's Ansidei Madonna (London National Gallery) is reading a book while Saint Nicholas and Saint John Baptist are in attendance at the two sides. The English government paid two sides. The English government paid £72,000 in 1885 for this wonderful painting. Other enthroned Madonnas of Raphael are the Madonna of Saint Anthony (owned privately) and the Baldacchino Madonna (Pitti Gallery, Among the early exponents of the Florence) enthroned depiction were Vivarini, Bellini and Cima; Girolamo dai Libri's altar-piece in San Giorgio Maggiore, Verona, is noteworthy, and Venice is perhaps richest in Madonna creations. Later masters to paint this subject were Titian, Tintoretto and Veronese Of the early type Cima's picture in the Venice Academy takes about first position; the Madonna is seated on a marble throne having a pillared portico. Palma's beautiful altar-piece in Vicenza is noteworthy among enthroned Madonnas. Bellini excelled in this style and the examples deserve their renown. Ruskin calls his painting in the Venice Academy "One of the greatest pictures ever painted in Christendom in her central art power." The Virgin is accompanied by three saints on each side and three choristers below. His Fram Madonna (Venice) has three compartments, the Virgin occupying the central one. His San Zaccaria Madonna, in spite of its fine execution and beauty of conception and grouping, was created when the artist was over 80 years old. Next we come (late in the 15th century) to Giorgione (who lived only 34 years) who has two Madonnas, one in the Madrid Gallery, the other in Castel Franco. In the latter the throne is exceptionally high, the upper step being above the heads of the accompanying Saints Liberale and Francis. This shows great depth and refinement of feeling

in the drooping head and dreaming eyes. While the queenly aspect of these Italian pictures is never displayed with a crown as is frequent on the mosaics dating from the 8th to the 11th century, except in the pictures by Giovanni da Murano and Carlo Crivelli (Venetian school), the Holy Virgin in German art is frequently crowned when enthroned, as in Holbein's Madonna at Darmstadt, that by Van Eyck at Frankfort and that by Memling at Bruges, and Schongauer's at Munich. In the enthroned Madonna of Quintin Matsys in the Berlin Gallery the Virgin is kissing the Child and the northern tendency is vividly displayed in the accessory of the stand containing food. Of modern artists whose enthroned Madonna creations are worthy of mention should be cited

Bouguereau, Ittenbach, etc.

The Annunciation.—The angel's announcement to the Spiritual Bride is a subject as prolifically depicted in Christian art as any other It was a theme displayed everywhere, in every village, street, church or dwelling, in painting or carving. Early we find it in the mosaics, as on the arch of the Santa Maria Maggiore. The attitudes of the Virgin differ in periods or in accordance with the individual conception of the artists. In some the angel stands before the young virgin who kneels in pious submission, or the angel kneels in some; or again, as in Giotto's work, in Padua, both kneel. Later artists picture Our Lady in the Annunciation often as a crowned queen, be-jeweled, but in modern work the Virgin and surroundings are treated with simplicity and mystic symbolism is given to the subject. While it is usual that but one announcing angel appears on the scene, Andrea del Sarto, Tintoretto, Francia and Fra Bartolommeo give an angelic choir. Usually the Holy Dove is seen flying toward Mary from the Father. Pisanello's Annunciation in Verona pictures the most beautiful innocence in girlish beauty. Beautiful purity is expressed in the works of Fra Angelico; that in the Oratorio del Gesù, at Cortona, accompanied by the colonnade and scene of Eve's expulsion as accessories, is extremely impressive. In the Uffizi Gallery is a Boticelli Annunciation depicting the angel paying the deepest obeisance at Mary's feet while the Holy Maid stretches out her hands in surprised humility. Other well-known Annunciations are by Simone Martin in the Uffizi, Fra Filippo Lippi, Carlo Crivelli (National Gallery, London), where the scene is produced in a surrounding of magnificent architectural decoration, while Perugino (in Montefalco picture) shows utter simplicity. Paolo Veronese depicts fear as the Virgin shrinks back at the message. Northern creations reveal their source by bringing in such accessories as a spinning wheel, couches, etc. Jan van Eyck places the Holy Virgin by an altar in an alcove with an open book to rest her arm on, her face averted toward the heavenly messenger, who is in a cope and carries a sceptre. Albert Dürer's series of the life of the Virgin depicts in the Annunciation Mary as a German Hausfrau, surrounded by many architectural accessories. In the National Gallery, London, we find Rosetti's work affording very simple treatment in modern depiction, and Burne-Jones gives the scene in a finely constructed painting.

The Nativity.— In the works of the masters

on this subject we find Mary beside her Son's cradle in the act of adoration. Even the early pictures show angels attendant but the veil found in earlier depiction is discarded later. The scene is cast in a cave or cleft in a rock generally transformed into a stable, but there are variations to suit the conceptions of the different masters. In Santa Maria, Trastevere, is a mosaic displaying Mary reposing on a couch in the cleft of a rock Giotto's school makes the scene a stable of wooden construc-tion; some place the theme in the open with perhaps a run or fragment of some structure as accessory. The swaddled Babe of the Italian school is, of course, the bambino of that country. Orcagna (church of Assisi) places Mary sitting beside the cradle arranging the covering, while Giotto has the Child before her while she is seated on the ground Perugua and Rome) discountry. gino's Nativities (in Perugia and Rome) display Mary and Joseph kneeling in adoration of the Babe with angels present Well known is the Nativity in the London National Gallery by Piero della Francesca (unfinished) in which the Child is lying on the ground with the mother kneeling beside while angels are playing on lutes and singing. That depiction by Luca Signorelli in the same place also shows the Infant on the ground, Mary kneeling beside Him. In the same gallery we have Botticelli's depiction of the scene enacted in a shed, and Carlo Crivelli uses the same surroundings. In Luini's picture an angel holds the Child while Mary kneels with folded arms, her face one of the most beautiful of any of the Madonnas. In most of the above and in others shepherds are portrayed in more or less proximity. In some cases the painting is properly called "Adoration of the Shepherds" on account of their close presence to the Virgin and Child, but later works generally place them in the background. The illumination of the scene frequently (with Rembrandt, Correggio, etc.) emanates from the glowing rays passing from the Holy Babe.

Adoration of the Magi. This was a favorite subject with the Catacomb dwellers and we find over 20 depictions of the scene in these subterranean galleries. Mary is seated on a throne and the Magi in their tunics and Physical Catalogue C Phrygian caps bring gifts of dishes and bas-kets. Their number runs from three to six. The early method of treatment makes the Babe rest in the mother's arms, but in the Santa Maria Maggiore (Rome) mosaic the Child is seated on a pedestal with hand upraised in benediction. Usually we find Him in His mother's lap. The emanating glory of the Babe frequently is the source of light and the benediction. diction act is frequently His pose. An Adoration of the Magi mosaic (about 6th century) is in the chapel of San Apollinare Nuovo at Ravenna, in which the Magi lead a procession of female martyrs bringing their crowns as votive offerings to the Madonna. Giotto's painting in Padua places the scene in a stable while Fra Angelico (National Gallery, London) chooses the entrance of a cave as the scene of the King's devotions. In Filippo Lippi's 'Adoration of the Kings' in the Uffizi, Florence, Mary is located in a wide landscape in which figure a host of persons surrounding her. Other noted Adorations are by Baldassare Peruzzi (London National Gallery), Pintu-ricchio, Mehling (Bruges), Rogier van Wey den (Munich), Rembrandt; Rubens painted 15, of which one is in Madrid, another in the possession of the Duke of Westminster.

Flight into Egypt.—In pictures brought under this title Many is sometimes seen seated on an ass with Joseph walking beside; the ox which tradition says accompanied them rarely appears in the paintings. Sometimes an angel leads the ass. Well-known depictions of this scene are by Giotto (Padua), Fra Angelico (Florence), Pinturicchio, Memling (Munich).

Riposo.—This phase of the Madonna series is more popular with artists of the past than the 'Flight.' It depicts the Holy Family after the tedious journey through the desert resting in a fertile country surrounded by funt trees, Mary bathing the Child, etc It was greatly favored by German and Flemish masters (Albrecht Altdorfer's in Berlin, Lucas Cianach, Martin Schongauer's in Vienna, etc.).

Pastoral Madonnas.—From the 15th century a new style of treatment of the Madonna theme arrives It is the placing of the Virgin in a landscape surrounding There are but few, such as Raphael's earliest Madonnas. Three most noted are La Belle Jardinière (Beautiful Gardener) in the Louvre; Madonna in the Gardener) in the Louvre; Madonna in the Meadow (Madonna in Grunen) in Belvedere Gallery, Vienna; and the Cardellino Madonna (Madonna of the Goldfinch) in the Uffizi, Florence. All three among the most prized paintings in the world and too popularly multiplication. People of the most prized paintings in the world and too popularly multiplication. plied to need description. Raphael's later work, the Casa Alba Madonna, is less well known with its turbaned Roman patrician depiction of the Virgin. Leonardo da Vinci's Madonna of the Rocks gives the Holy Virgin, in the foreground of a grotto, grouped with the Child and the infant John Juni Science of the Madonna of the infant John Juni Science of the State of the State of the Infant John Juni Science of the State ground of a grotto, grouped with the Child and the infant John. Luini painted a pastoral Madonna (in the Brera, Milan), but very noted is Correggio's 'La Zingarella' (Gipsy) or 'Madonna del Corniglio' (Naples) which is posed in a lovely landscape as is also his kneeling Madonna in the Uffizi, both of which always call forth admiration Palma Vecchio's 'Santa Conversaziones' in Naples, Dresden, Munich and Vienna are public favorities. In the basand Vienna are public favorites. In the pastoral class of Madonnas must be included the three "enclosed garden" examples by Francia (Munich), Filippino Lippi (Florence) and by Schongauer, in which the Virgin and Child are surrounded by a hedge of roses with a landscape in the rear perspective.

Domestic Groups .- This method of depiction of the biblical scene was vogue among painters of the middle 15th century. They consisted of the Holy Virgin and Child associated with Saint Joseph, Saint Elisabeth and her son, and frequently other attendants. A number depict Saint John Baptist child playing with the Holy Infant; Saint Ann, mother of the Holy Virgin, appears in some; da Vinci even depicts (in a cartoon) Our Lady seated on Saint Ann's knees. Girolamo dai Libri (London National Gallery) painted such a group, and Perugino has a work in which Saint Ann rests her hand on the Virgin's shoulders while boys and women relatives are grouped about. Very popular are the groups that include the infant Saint John Baptist playing with the Child (as Raphael's in National

Gallery, London') Both Botticelli and da Vinci created pictures of Saint John adoring the Infant In the same inspiration is Luini's 'Madonna dell' Agnello' at Lugano. Another popular group subject adopted in pictures by Titian, Perugino, Correggio, Parmigiano, Borgognone, Memling, etc., is the 'Marriage of Saint Catherine,' in which the Child is placing a ring on the finger of the saint. Good modern representations of such groups are by P. A. J. Dagnan-Bouveret in the New Pinakothek, Munich, in which the holy mother, depicted as a peasant, is seated on a bench in the carpenter's shop and the Child at her breast, under her mantle, illuminates and pierces with rays of glory the coarse textile. But, though numerous, both French and German modern paintings of the Madonna lack the devotion or even inspirational features which give such glory and beauty of conception to the early Italian masters and those of the Renaissance.

Madonnas in Domestic Surroundings.—These include the 'Holy Family' series The worldly environment in depiction of this mystic religious subject has found few exponents, and those confined largely to northern artists. To the German and Dutch the maternal dignity of the Hausfrau appeals so strongly as to call from their limners' hands sacred Madonnas in everyday household surroundings. Of such we have pictures by Quintin Matsys (Munich) with its Flemish sleeping apartment, having the Virgin and Child as occupants, the 15th century German artist Schongauer (Belvedere Gallery, Vienna) gives Joseph feeding the cattle from hay in his arms looking with fondness in the doorway at the Virgin holding a bunch of grapes while the Child nestles in her lap But in Italy, Giulio Romano in his Madonna della Catina (Dresden) portrays the Divine Babe in a basin (catina), ready for the bath, while the infant Saint John pours water from a ewer. The Madonna dell' Impannata (of the papered window), formerly considered as Raphael's and later ascribed to Romano, pictures Elisabeth, Mary Magdalen and the child Saint John beautifully grouped with the Virgin and Child. The picture of the French artist Mignard (Louvre) called 'La Vierge à la Grappe' is well known. Salembin's Holy Family (Pitti Palace) depicts the gambols of the Child Jesus and Saint John with puppies. Rembrandt's two 'Ménage du Menuisier' (carpenter's home), in the Louvre and Petrograd, picture a combined living and workroom with Joseph at his bench and Mother and Child as central subjects; his painting in the Munich Gallery also brings Saint Joseph as carpenter into the scene.

Mater Amabilis.— The Madonna of Love. Some consider this the most popular type of the Madonna in Art. The depiction of a mother's love is one of the most endearing themes of the artist for all humanity. Raphael's sublime depictions, of course, lead in this type with his Madonna Tempi (Munich), in which the Virgin Mother presses her lips to the Child's cheek His Conestabile (Petrograd) and Ansedei Madonnas and Babe peering in companionship into the Book of Wisdom belong here, also the Holy Family of Francis I, in which she stoops to lift the Child from the cradle and the Madonna della Sedia (chair

Madonna) in the Pitti Gallery, Florence, embracing the Infant Correggio's painting in the Uffizi really belongs to this series with the Virgin stooping over the Babe, and his Madonna del Cesta (of the basket) in the London National Gallery, named after the basket (cesta) lying on the floor; and his Madonna del Latte (Petrograd), also his Madonna della Scala (of the Staircase) in Parma are surely of this category. Titian sometimes created such a Mother of Love as in his 'Vierge au Lapin' (Louvre) in which she is calming a rabbit for her Child to play with, also the Madonna with Saints Ulfo and Brigida (Madrid) in which the Child is accepting a gift of flowers from the latter saint, and another in the Uffizi Gallery Of pictures portraying the Holy Mother suckling her Babe there are a number, best known perhaps being the Madonna of the Green Cushion (Louvre) by Andrea Solario And the Mother watching the sleeping Babe is another phase of the theme treated by masters of art, such as Raphael's Madonna of the Diadem (Louvre), others by Guido Rem (Rome), Sassoferrato, Carlo Dolce, etc. And among northern artists the Mater Amabilis has been pictured by Durer, Holbein (Meyer Madonna), Rembrandt, Rubens, van Eyck, Schongauer. Among modern artists who have created fine pictures of this theme are Gabriel Max, Bouguereau, Carl Muller, N. Barabino, Dagnan-Bouveret, Guay, Macomber, Bodenhausen.

Madonna in Gloria.—The Madonna in the Sky. These usually represent a landscape below and the Madonna in the upper sky. In the Madonna dell Stella by Fra Angelico, in San Marco, Venice, a star is located over the head posed on the veil, the figure is full length surrounded by a mandorla of golden rays. The Madonna of Saint Sebastian (Dresden) has a surrounding of cherubs and clouds with saints below Moretto (Brescian school) treated the theme traditionally, but very lovely is his Madonna of San Giorgio Maggiore, Verona, which shows very naturalistic effects in atmosphere above and depicts Saints Cecilia, Lucia, Catherine, Agnes and Barbara beneath; another of his is in the Berlin Gallery, a mandorla encompassing Mother and Child Three paintings on this subject are in Venice by Gianfrancesco Caroto, also one by Cavazolla (Morando); these all are of the Brescia school. Tintoretto and Titian produced creations of this theme. Raphael gave us the Foligno Madonna (Vatican), which is greatly admired, but his Sistine Madonna (Oresden) brings us to the apex of highest inspiration with its majestic full-length figure in perfect poise and the charm of the cherubs surpasses all found in other depictions. Later came the selection of the crescent moon on which artists posed the Madonna in Glory; the exponents of this style are Albrecht Durer, Sassoferrato (Vatican), Tintoretto (Berlin). Modern painters of the theme are Bouguereau, Bodenhausen, Defregger, etc

Pietà.—This is probably the most popular and touching conception of the Madonna in Art. Every Roman Catholic church has one. It is the representation of the Virgin displaying the complete sacrifice. Francia's beautiful conception of the theme is shown in his painting in the London National Gallery, in which the outstretched limp body of the Crucified

One lies across the lap of the Holy Virgin while an angel on either side attends Luini portrays the Head, crowned with thorns, falling back on the Mother's brow while she supports The same scene with Saint John and Mary Magdalen attending is often termed a Pieta but correctly the groups should consist of Mother and the lifeless Savior, perhaps with angel or angels attending. Giovanni Bellim's painting in the Ducal Palace, Venice, shows the Crucified One being raised from the tomb by Mary, His head resting on her face, Saint John holds up His arm; another by this master is in the Uffizi Gallery. Crivelli painted two very pathetic Pietas, one of which is in the Vatican In the Pitti Palace is a Pieta by Fra Bartolommeo of most touching aspect But Michelangelo's great group in the Vatican is said by many to be unsurpassed in its sublimity.

Mater Dolorosa.—The Divine Mother in anguish. This theme has called forth from the anguish. This theme has called forth from the great painters facial expression of excruciating human agony of the most touching and pathetic depiction ever accomplished. The true pathos of sorrow displayed by the Spanish school is very prominent, Murillo's depictions excelling in their pictured anguish and tears. Tradition poses the hands clasped, the veil casting a shadow on the Virgin's head, the face, with its shadow on the Virgin's head, the face, with its welling tears, glancing upward. At times the Madonna is placed at the foot of the Cross For the most part the face is of middle age, except as with Michelangelo, who depicts youth and to a critic declared "Purity enjoys eternal youth", Reni and later artists frequently depict a young maiden. Many of the paintings of the Mater Dolorosa type are but the head, others half-length figures. A beautiful example of Quintin Matsys' is in the London National Gallery. Many of the creations are disfigured by the unnecessary swords depicted as piercing the Virgin's bosom, referring, of course, to Simeon's prophesy. They are supposed to emphasize the pathetic subject — Vandyck uses the weapons.

Other phases of the Madonna theme pic-Other phases of the Madonna theme pictured by masters are many but space forbids further description. Of such are the subjects known in the art world under the titles: "Purification," "Presentation to the Temple," "Assumption," "Last Judgment," "Seven Joys and Seven Sorrows of the Virgin," etc.

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MADOQUA, mad'o-kwa, a diminutive antelope (Cephalolophus abyssinicus), one of the duiker-boks (q.v.), common in Abyssinia. The fore-parts are rufous, but gray is the prevail-ing hue. The same name is sometimes applied

to other very small north African antelopes, as the Beni Israel

MADRAS, British India, the capital of the presidency of Madras, on the Coromandel coast, lies on an open, sandy shore, exposed to the swell of the Bay of Bengal, which breaks upon the beach with great violence. It is 835 miles southwest of Calcutta. A modern harbor formed by two piers obviates the former dan-gerous passage through the suif. The city is built on level ground and with its nine suburbs occupies 27 square miles. The chief commercial portion is Black Town, now George Town, closely and irregularly built, containing the native and East Indian (or mixed) population, with a few European merchants and their families On the south is the ancient Portugues guese settlement Saint Thomé founded in 1504, with a Roman Catholic cathedral One of the chief objects of interest is Fort Saint George, which commands George Town and the network of roads, and may be considered the nucleus of the city It was built in 1639, and is admirably situated for the defense of the town and shipping It contains a church, the barracks, and an arsenal The government-house, the cathedral of Saint George and some of the other churches and public buildings, are handsome structures Besides the university, the Presidential College and a medical college, supported by government, there are large missionary institutions The public park, containing a small zoological collection, is the chief recreation ground of the city. From the meridian of the observatory connected with the university all India takes its time. Madras is the chief seat of the provincial government offices, of the Supreme Court, a board of revenue, marine board, etc. Notwithstanding the disadvantages of its position it is a place of great trade, and a new harbor has greatly tended to increase traffic. The landing and shipping of goods is effected partly by lighters to the pier-head inside the harbor, and partly by the old massula or surfboats, which land their cargoes on the beach. The imports are chiefly manufactured goods from the United Kingdom, especially cottons, wines, spirits, metals, stationery, etc. Among the principal exports are cotton, grain, indigo. the principal exports are cotton, grain, indigo, coffee, tea, hides, oil-seeds, dye-stuffs, pepper, etc. The chief industries are connected with the preparation of goods for export, such as coffee pressing and cotton cleaning. Cottonspinning factories have been established at Madras The country at a short distance from the city presents a remarkable contrast to its barren sandy shore, having the appearance of a fine park. The mean annual temperature is 82°, which rises in the hot weather to 96° in the shade The city has railway communication with all the principal places of India, has good water supply and sewerage systems, is lighted by electricity and gas and is administered by a body of 32 commissioners.

Madras was founded in 1639 by the English, who obtained the grant of a piece of ground for the erection of a town and fort (Fori Saint George) from the Rajah of Chandgherry. It soon became a flourishing city and the chief station of the English on the Coromandel coast. In 1746 it was taken by the French, who kept it until 1749, when peace was made and the place was restored to the English by the Treaty of

Aix-la-Chapelle. In 1758 it was again besieged by the French under the celebrated Lally, who was obliged to retreat after a siege of two months. Pop about 647,000, of whom 88 per cent are Hindus, 9 per cent Mohammedans and 3 per cent Christians.

MADRAS, ma-dras', British India, a presidency occupying the southern portion of the Indian Peninsula. It stretches from the Bay of Bengal to the Arabian Sea, almost enclosing Travancore and Mysore, while a long, narrow portion extends along the west side of the Bay of Bengal till it meets the Bengal province about 70 miles from the mouth of the Mahánadi. It has a total area, excluding native states, of 142,260 square miles, the area of the native states being 10,696 square miles. Jaipur and Haidarabad bound it on the northwest, while the west borders for a short distance with Bombay. The chief mountain ranges are the Western Gháts, the Eastern Gháts and the Nilgiri Mountains. The principal rivers are the Godáveri and Kistna, with their tributaries; and the North Penner, South Penner, Palar, Kaveri, Coleroon and Vaiga There are no lakes of any importance, but many salt lagoons or inlets of the sea. Extensive forests yield teak, ebony and other valuable timber trees. The wild animals are those common to other parts of India, the elephant, tiger, chetah, bear, bison, elk, spotted deer, antelope, jackal, wild hog, jungle sheep, etc. The climate generally is reckoned the hottest in India, but differs wildly in different localities according to elevation. Of the population, 71 per cent is engaged in agriculture, and 86 per cent of the cultivated area is under food crops. The soil along the coasts, particularly that of the Carnatic, is for the most part light and sandy; inland it consists of a decomposed syenite impregnated with salt, which in dry weather covers the ground with a saline efflorescence. The district of Tanjore on the banks of the Coleroon is esteemed the granary of southern India. The principal vegetable productions are rice, wheat, barley, maize and all the other grains common in India; sugarcane, areca, yam, plantain, tamarınd, jack-fruit, mango, melons, cocoanuts and a variety of other fruits; ginger, turmeric, pepper, tobacco, hemp and cotton, for the growth of which the soil seems to be particularly well adapted. Tea is grown to some extent Weaving is the only indigenous art of any consequence, and cotton cloth, muslins, carpets and silks are manufactured to a limited extent. The grand total of sea-borne trade for 1936-37 was rupees 661,000,000. Of external trade, 66 per cent is with the British Empire, and 33 per cent with the United Kingdom. The government of the presidency is vested in a governor subordinate to the governor-general of India. The revenue usually exceeds the expenditure, but the apparently healthy condition of the finances is largely illusory, as the presidency has been living on windfalls in the shape of grants from the Indian government. At the head of the educational institutions is the Modern Hairweiter. cational institutions is the Madras University, an examining body, and since 1923 a teaching university, granting degrees in arts, law, medicine and engineering. There are various schools and colleges affiliated to the university.

The province is divided into 22 districts with

a population of about 46,700,000. The native feudatory states of Travancore, Cochin, Banganapalle, Puddakotai and Sandur, with a total population of about 5,461,000, were in 1923 placed in direct relation with the government of India. The languages are Tamil, Telugu (spoken by the great majority of the inhabitants), Canarese and Malayalam, with lesser dialects spoken by the more barbaric tribes in the mountains; Mahrathi and Gujerathi in the northern and northwestern parts; Uriya in the northeast; while Hindustani is the language spoken everywhere by the Mohammedans. Capital, Madras (q.v.). See also India.

MADRAS HOUSE, The, is not only an admirable example of the work of Granville Barker as a dramatist but also of the modern type of play written by, and for, those who conceive of the theatre as a place where it is permissible, even enjoyable, to think as well as to feel. It does not depend for its effect on thrilling situations, violent emotions or cunningly devised mystery but depicts the dramatic interplay of character and circumstance under normal conditions with a skill, insight and humor which afford even more pleasure, perhaps, to the reader than to the spectator. Of all the wide variety of human relations involved in the play, none are dealt with, so to speak, in actual crisis and there is a resulting lack of dramatic tension, but the author succeeds, nevertheless, in making one acutely conscious of the intensity and force of the emotions that underlie the surface not only of the play but of life. The two main themes are business and sex. The particular aspect of business which is presented is one that is unfamiliar in America, namely, the "living-in" system, inherited from the days of guilds and apprentices in England, under which clerks and other employees receive board and lodging as part of their wages It is obvious that in a large "drapery establishment" employing both men and women, like the Madras House, such an arrangement would be likely to give rise to social complications. The business theme, therefore, although open to the reproach of being local in its application, may boast the charm of novelty for Americans. The sex interest, on the contrary, is of the familiar, universal, all-pervading variety. It inter-penetrates the life of the conventional suburban family, into which we are introduced in the first act; it comes frankly to the fore in the second, in the case of Mr. Brigstock, "third man in the hosiery," and one of the "lady shop assistants"; it pulls the strings during the sale of Madras House to an American millionaire in the third act; and it looms largest of all in the last act, in which that unconscionable old lady-killer, Constantine Madras, finally renounces his family and the trammels of conventional morality and turns Mohammedan. In this, as in his other plays, Barker, following Bernard Shaw's lead, omits the customary list of dramatis personæ and introduces his characters in a sort of literary preface to each act which is no less interesting and illuminating than the dialogue. "The Madras House" was written in 1910 and was first produced at the Duke of York's Theatre in London on 9 March of the same year under the direction of the author.

MADRAZO, ma-drä'thō, Raimundo de, Spanish painter. b Rome, Italy, 24 July 1841; d. 1920 He studied under his father, Federigo de Madrazo, and Léon Cogniet in Paris. He was very successful in portrait and genre and numbered many prominent Americans among his sitters. He was equally happy in pastel and oils, and his 'Fête during the Carnival' in Mis W. K. Vanderbilt's collection is as brilliant in conception as in technique. Among his most celebrated portraits are those of the Queen Regent of Spain, the Countess Pillet-Will; Mrs. Cornelius Vanderbilt; Mrs. Whitney; Miss Anne Morgan; Madame Madrazo; Samuel P. Avery. 'The End of a Masked Ball' was awarded a first class medal at Paris in 1878 and was subsequently purchased by W. K. Vanderbilt Other genre works all of a high order are 'Fête during the Carnival'; 'Girls at a Window' (both in Metropolitan Museum, New York); 'Lady with a Parrot' (purchased by W. A. Clark, New York); 'Lady with Guitar'; 'Déjeuner of the Infanta'; 'Pierrette.' Madrazo was made commander of the Legion of Honor. His brother, Ricardo (b 1852), was also a pupil of his father and achieved some success as a portrait and genre painter

MADRAZO Y KUNT, Federigo de, Spanish painter: b. Rome, 12 Feb. 1815; d. Madrid, 11 June 1894. His father, José de Madrazo y Agudo (1781–1859), was a painter of note and from him Federigo received his early instruction Subsequently he studied under Winterhalter at Paris His early works are 'The Resurrection of Christ' (1829); 'Achilles in his Tent'; 'The Continence of Scipio' and portraits of Baron Taylor and Ingres; 'Godfrey Proclaimed King of Jerusalem' (1837). Thereafter he went to Rome and while there painted 'Maria Christina' (1843); 'Queen Isabella'; 'The Duchess of Medina-Cell'; 'Countess de Vilchès' (1847), and several portraits In 1873 he was elected foreign member of the Paris Academy of Fine Artis After his father's death he became director of the Prado Gallery and director of the Academy of San Fernando. He founded El Artista, the pioneer of Spanish art journals; it was followed by El Renacimiento and El Semanario pintoresco. Of his later works the best known are the genre pieces, 'The New Song'; 'The Cigarette'; 'The Musical Matinee,' etc His brother, Louis de Madrazo, was also a painter His best work is 'The Burial of Saint Cecilia' (1855).

MADRE DE DIOS, ma'dre de de'oos, or AMARU-MAYU, Bolivia, a river, the chief affluent of the Beni, rising in the Carabaya Mountains, Peru, about 50 miles east of Cuzco, and after an easterly course, south by north, of 900 miles, chiefly through the Bolivian department of La Paz, uniting with the Beni at Rivera Alta, where it is 1,500 yards wide. It was explored in 1865 under the auspices of the London Geographical Society, and since 1881 has been the highway for the exploitation of the rubber forests along its course.

MADREPORE, a genus of coral-forming polyps (see Coral and Coral Islands) containing numerous species from the warmer and tropical seas of all parts of the earth. The true Madrepores increase by budding, the re-

sult being usually large branching colonies in which the coral between the cups containing the polyps is perforate and spiny. The different species frequently attain large dimensions and constitute one of the most important elements in the formation of coral reefs. The polyps have 12 septa and 12 tentacles, 6 being large, the other 6 smaller, while a peculiar feature is the presence of 6 U-shaped tubes connected with the æsophagus at either end The term Madreporaria is sometimes used to include all polyps in which the parts are arranged in multiples of six, and which secrete coral on the external surface of the body.

MADRID, ma-drid' (Sp. ma-dred'), Spain. the capital of the republic and of the province of Madrid, a part of New Castile, situated near the centre of the country, on the lest bank of the Manzanares, a sub-affluent of the Tagus. It is built on several low and irregular sandhills on a plateau 2,140 feet above sea-level, and is surrounded by a barren and extensive plain, treeless save in the vicinity of the city, and stretching northward to the snow-capped Sierra de Guadarrama. In winter the climate is exceedingly severe, and even in summer, when the heat is excessive, piercingly cold blasts descend from the mountains The prevailing winds are the parching southeast Solano, and the icy north wind from the Guadarrama. The climate is described in a Spanish proverb as "three months" of winter and nine months of hell." The temperature ranges from 18° to 105° F.; is subject to frequent and sudden changes; and between the sunny and shady sides of a street the dif-ference of temperature is sometimes as great as 20°. Madrid was until recently surrounded by a wall 20 feet high, pierced by 5 large and 11 small gates; of these gates 3 remain: the Puerta de Alcala on the east, the Puerta de Toledo on the south, and the Portillo de San Vicente on the west. The streets are distributed somewhat irregularly around the Puerta del Sol, which is in the centre of the capital. The principal streets are broad, long and airy; and the houses are in general well constructed,

substantial and of good appearance.
In common with most European capitals,
Madrid has undergone much modern improvement; the streets are traversed by electric and horse car lines; are lighted by gas and electricity; the telephone system is efficient; and sanitation has been much improved. The former abundant and pure water supply, is, however, inadequate to the demands of the growing population. Madrid has no edifices of great antiquity. The royal palace, situated at the western extremity of Madrid, is one of the most magnificent in the world. It occupies the site of the original Alcazar (castle) of the Moors, and is of enormous extent, being 470 feet each way, and 100 feet high. The architecture is a combination of Ionic and Doric. It contains a small but splendid Corinthian chapel, and a library of nearly 100,000 volumes, and the armory is one of the finest in the world. The Chamber of Deputies, which occupies an area of 42,700 square feet, has a hexastyle Corinthian portico on the grand façade, destined for the entrance of royalty on state occasions. On the two lateral façades are the entrances for the members. The Royal Exchange and the Bank of Spain are two modern imposing buildings.

Madrid stands far behind many provincial towns as regards its churches, which are, with exception of a few attached to conventual establishments, poor and of indifferent artistic merit. The church of San Jeronimo el Grande is probably the most distinctive. The most important of the charitable institutions are the military hospital, an extensive building in the northwestern corner of the city; and the Hospicio of San Fernando, with schools for both sexes, the pupils being taught various handicrafts. At the southeastern corner of the city stands the general hospital There are also hospitals for orphans and for foundlings, and numerous charities, mainly of a religious kind.

numerous charities, mainly of a religious kind.
Madrid has 72 public squares, which are
generally irregular both as regards their form and their edifices, as well as deficient in decorative monuments. Of these the Plaza Mayor is one of the largest and most regular. The Plaza de Oriente is adorned with 40 statues of Gothic kings, as well as those of the Asturias, Leon, Castile and Aragon In the centre is a fine equestrian statue of Philip IV. Among places of amusement the most popular is the Plaza de Toros (bull-ring), a building which is about 1,100 feet in circumference, and capable of containing 12,000 spectators. The Prado, a sort of wide boulevard, about two miles long, running north and south on the east of the city, is the chief promenade, and beyond it is the chief public park, including the Buen Retiro gardens, near which are the new handsome building for various ministerial departments and the new station of the Southern Railway Company. The Royal Picture Gallery which stands in the Prado contains more than 2,000 pictures, including a great many by all the best masters, especially those of Spain. There are also good pictures in the Academy of Fine Arts. The National Library, founded by Philip V, contains 650,000 volumes The Library of San Isidoro consists of 66,000 volumes. The University of Madrid the most important in Spain) which arose out (the most important in Spain) which arose out of that of Alcalà de Henares, founded in the 15th century, has an average attendance of 5,000 students There are besides numerous other schools, academies and colleges, public and private, including a normal school, a deaf and dumb institution, a normal school for the blind, a commercial school, schools for engineers, a conservatory of music, an academy for the fine arts with a picture gallery, a veterinary college, an academy of medicine and surgery, etc. The famous monastical and palatial Escorial (qv.) is 27 miles northwest of the city.

The industries have shown a remarkable development during the last decade, the chief manufactures being tobacco, leather goods, chocolate, beer, shoes, boots, plated ware, coaches, gloves and fans There is a royal carpet and tapestry factory in the Pacifico suburb. The commerce is important, as Madrid is the entrepôt for all the interior provinces. Retail business is mainly in the hands of foreigners, mostly French, but most of the wholesale trade is carried on by native houses Madrid has railway communication with Paris and Lisbon, and the chief cities of the Peninsula.

Madrid in the Roman period probably was the insignificant hamlet Majoritum. Under the name Majorit it appears as a Moorish outpost of Toledo when captured in 932 by Ramiro II

of Leon Henry IV about 1461 made some additions to the older town, which was placed on the western eminence over the river. Madrid only began to be a place of importance under Charles V Declared the seat of the court by Philip II in 1560 the city rapidly grew up at the expense of the older and better situated capitals. It was the creation of a century, and its increase was very slow after the age of Philip IV The gross mistake of a position which has no single advantage except the fan-cied geographical merit of being in the centre of Spain was soon felt, and on Philip II's death his son, in 1601, endeavored to move the court again to Valladolid, which, however, was found to be impracticable The French under Murat entered Madrid in 1808 but soon evacuated it The French held it again from 1909-12 when Wellington took it and restored it to the Spaniards. After 1873 it suffered greatly from civil struggles and in 1937 it was besieged by Generalissimo Franco, but the city held out through bombardments and air attacks until May 1939 when the Loyalist government surrendered it to the insurgent Nationalists. The population of the city in 1934 was 1,048,072 and that of the province, which has an area of 3,084 square miles, was 1,535,322. No population figures were available after the civil war, 1937-39.

MADRIGAL, a short lyric poem generally on amatory subjects. Those of Tasso represent the finest specimens of Italian poetry.

MADRONA, a large and ornamental tree of California (Arbutus mensiesu), of the heath family, which often grows nearly 100 feet in height. It has a wide-spreading head, small evergreen leaves and the limbs and large parts of the trunk, where the thin outer bark easily peels off, are bright red. It grows in the foothills, and up to a moderate elevation, but not naturally in the valleys. It is a near relative of the strawberry tree of Europe.

MADSTONE, a vegetable substance or stone which when applied to a wound caused by the bite of a mad dog is said to prevent hydrophobia. The most famous one in the United States is owned by the descendants of a family named Fred, in Virginia This stone was brought over from Scotland in 1776 It is said to be the one spoken of by Sir Walter Scott in 'The Talisman' and has been religiously preserved as one of the most valuable relics of the age. It is about two inches long by one inch broad, and about half an inch thick, and is of a chocolate color. When applied to the wound it adheres till all the poison is absorbed, when it drops off. It is then soaked in warm milk or water for a time, and when removed the liquid is found to be full of a greenish-yellow scum. It is said that of the 130 cases in which it has been applied for the bite of a mad dog, none ever suffered from hydrophobia There are said to be three authenticated madstones in the United States.

The belief in a madstone was common hundreds of years ago in the East, and travelers in India in 1677 and 1685 make mention of it. Tradition said it grew on the head of certain snakes George F. Kunz, a New York expert in gems, identifies the madstone, or snakestone of the East, with the stone known as tabersheer, which is a variety of opal found in the joints

of the bamboo in Hindustan and Burma. This stone is formed of juice which by evaporation becomes mucilaginous, then a solid substance, and when placed in the mouth will adhere to the palate or cause water to boil Sir David Brewster says it is found in the joints of diseased corn-stalks and is formed by sap depositing silica.

MADURA, ma-doo'ra, southeastern Asia, an island of the Malay Archipelago, Dutch East Indies, off the east end of Java, from which it is separated by the Strait of Madura The island is about 105 miles long east to west, and 30 miles broad, with an area of 1,770 square miles. Madura forms one of the 17 Dutch residences or provinces into which Java and Madura are divided, and is administered by a governor or resident The Dutch first landed in Madura in 1747. It is undulating but not mountainous, and though in general well watered, in some places, especially on the coast, there is a want of water, and the soil is unfertile. The interior, however, is fertile, though not so productive as Java Maize, cocoanuts, tobacco, Jamaica pepper, tamarinds and salt are the chief products; stock-raising is an important industry; and the exports include also birds'-nests, country cloths, white and striped, poppy-oil, rattan-mats and baskets, etc. The chief towns are Bangkalang (pop. 24,000), Pamekasan (the capital, pop 22,000), and Sumanap. Pop 1,843,601, of whom 4,734 were Chinese and 621 Europeans

MADURA, southern India, the capital of a district of Madras, 344 miles by rail southwest of Madras It was the capital of the ancient Pandhyan kingdom, for over 2,000 years was the political and religious capital of southern India, and is noted for its interesting architectural monuments, chief of which is the Temple of Minarchi, dating from almost prehistoric times, restored and added to by Tirumulla Nayak (1622–62). It ranks fourth among the seven strongholds of Hinduism, and occupies a parallelogram of 56,000 square feet containing 50 buildings. The city was known to the Greeks and Romans Cotton and tobacco manufactures and coffee mills, are the principal industries. Madura is the seat of Catholic and American Protestant and other missions, and has several high-grade educational institutions. Pop. 182,018.

MADVIG, mad'vig, Johan Nikolai, Danish scholar. b. Svanike, island of Bornholm, 7 Aug 1804; d Copenhagen, 13 Dec. 1886. Educated at Frederiksborg and Copenhagen, he was from 1829 till 1879 professor of Latin in the University of Copenhagen. He took a profound interest in the politics of his country, and from 1848 till 1851 was Minister of Education and Religion. He is best known by critical editions of Latin classics and by his Latin grammar translated into English and most European tongues. His chief works are 'Emendationes in Ciceronis Libros Philosophicos' (1828); 'Cicero's De Finibus Bonorum et Malorum' (1839, amended 1876); 'Ciceronis Orationes Selectæ Duodecim' (1830); 'Cicero's Cato Major and Lælius' (1835); 'Opuscula Academica' (1834-42; new ed., 1887); 'Emendationes Livianæ' (1860); 'Livii Opera' (with Ussing, 1861-66); 'Adversaria Critica' (1871-84); 'Latin Grammar' (1841); 'Greek Syntax' (1846); 'Con-

stitution and Administration of the Roman State' (1881-82); 'Autobiography' (published posthumously, 1887). Consult Sandys, J. E., 'A History of Classical Scholarship' (Cambridge 1908)

MÆANDER, mē-ăn'der, now MENDERES, a river of Asia which arises in Phrygia not far from Celænæ. It forms the boundary between Caria and Lydia, and flows into the Icanian Sea between Priene and Myus, opposite Miletus. It covers a course about 200 miles long, is deep and narrow, and navigable only for small vessels. It was celebrated among the ancients for its winding course, and gave its name to the intertwined puiple borders on mantles and other dresses, as well as upon uins and vases.

MÆANDRINA, mē-ăn-di'na, one of several genera of brain corals, so called from the elongate and meandering cups containing the polyps, which give a spherical mass of these corals an appearance strikingly like the human brain with its convolutions. This appearance is due to the fact that the polyps in their growth do not completely divide, but stretch out into long bands, frequently brainching, with many mouths and tentacles, and a common body and digestive cavity. Brain corals occur in all tropical seas, several species being found in Florida and the West Indies. Their solid masses make them important factors in the formation of coral reefs.

MÆCENAS, mē-sē'nas, Gaius Cilnius, Roman nobleman b. between 73 and 63 BC; d Cilnius, 8 BC. He was the friend of Augustus, and patron of Virgil and Horace. It is unknown where he received his education, but he was intimate with the literatures both of Greece and Rome, and was himself an occasional writer in prose and verse We first hear of him authentically (40 B.C.) as negotiating a marriage between Octavianus and Scribonia; and in the same year he contributed materially to bring about the Peace of Brundisium, by which Octa-yian and Antony were reconciled Two years later he was again employed in reconciling these self-willed potentates; and 36 BC he was twice dispatched by Octavian from Sicily to Rome to quell disturbances which had broken out there. He was for these services entrusted with the administration not only of Rome, but of all Italy, when Octavian became emperor with the title of Augustus. His palatial residence and gardens on the Esquiline were the rendezvous of all the literati of Rome, and of numerous parasites. But those admitted to his intimacy were the greatest geniuses and scholars of Rome, among them being Virgil and Horace. To the intercession of Mæcenas, Virgil was indebted for the recovery of his farm, and Horace also owed to him many favors. Consult Bachrens, 'Fragmenta Poetarum Romanorum' (Leipzig 1886); Harder, F., 'Fragmenta des Mäcenas' (Berlin 1899)

MAELAR, Lake of. See Mälar

MAELSTROM, māl'strom, or MOSKOE-STROM, Norway, a rapid current or tidal whirlpool off the northwest coast immediately southwest of Moskenesoe, the southernmost of the Lofoten Isles The current runs with the tides alternately, six hours from north to south and six hours from south to north, producing

immense whirls The depth of the water around, supposed at one time to be too great to admit of soundings, has been ascertained not to exceed 20 fathoms, with a bottom of rocks and white sand. Immediately to the west the soundings are from 100 to 200 fathoms The whirlpool, idealized by mediæval and later writers, including Edgar Allan Poe, is greatest at high or low water When the wind is northwest and opposed to the reflux of the waves it attains its greatest fury, and becomes extremely dangerous, but in ordinary circumstances it may be traversed without difficulty

MAES, or MAAS, mas, Nicolas, Dutch painter b Dordrecht, 1632, d Amsterdam, December 1693 He entered the studio of Rembrandt at Amsterdam about 1650 and studied there about four years, attaining a style of execution and coloring so similar to that of his master that many of his paintings were for a long time believed to be Rembrandt's work. He returned to Dortrecht in 1654 and in the succeeding 10 years did his best work, which retained the influence of Rembrandt, particularly in coloring From the time of his going to Antwerp in 1665 his style changed and he abandoned the domestic genre type of work for that of portraiture, and his subsequent pictures show the influence of Van Dyck. So different were the characteristics of the two periods that at one time it was believed that there were two artists of the same name. Of his earlier and better period notable examples are 'The Reverie' (Ryks Museum, Amsterdam); 'Card Players' (National Gallery, London); 'The Eavesdropper' (Six Gallery, Amsterdam), 'Young Girl Peeling an Apple' (Metropolitan Museum, New York); 'Hagar's Departure,' long believed to be a Rembrandt (Earl of Denbigh's Collection); 'The Listening Girl' (Buckingham Palace). Numerous other examples exist in the galleries of Berlin, Brussels, Munich, The Hague, Frankfort, Hanover and Petrograd.

MAESTRICHT, mās'trīht, Netherlands, the capital of the province of Limburg, on the left bank of the Maas, at the confluence of the Geer, hes on the Belgian frontier, 19 miles north-northeast of Liége, 56 miles east of Brussels and 52 miles west by south of Cologne. Among the chief buildings are the church of Saint Servais, partly Romanesque and partly Gothic, dating from the 10th century, the townhall, the courts and general prison and the ar-senal. The fortifications were dismantled between 1871 and 1878; it is, however, still a considerable garrison town. Maestricht carries on an active transit frade with Belgium, and has manufactures of glass and earthenware, firearms, shot, cloth and paper-hangings; also ironfoundries, beet-root sugar refineries, tobacco and cigar factories, tan-pits, distilleries and breweries, the latter producing very noted beer. About three miles from the town is the Pietersberg (Peters Hill), on which stands the fort of Saint Pierre, and under which are extensive subterranean quarries of extraordinary interest, the excavation of which is supposed to have been begun by the Romans. Maestricht was besieged and taken and 8,000 of its inhabitants were massacred in 1579 by the Spaniards under the Duke of Parma; in 1673 it was taken by Louis XIV, and again by the French in 1748 and 1794. William III of England failed to capture it and in 1830 its garrison resisted successfully the attacks of insurgent Belgians. Pop (1937) 66,430.

MAESTRICHT BEDS, in geology, a series of calcareous beds 100 feet thick, on the banks of the Meuse, near the Dutch city of Maestricht The Maestricht calcareous rock contains Belemitella, nucronata, Pecten quadricostatus, etc, also the genera Braculites, Hamites, etc, which are only Mesozoic It is a connecting link between the Secondary and the Tertiary rocks, but in all essential respects belongs to the former

MAETERLINCK, měťer-lĭnk, Maurice (Gallicized from the original Mooris Mater-LINCK), Belgian author. b Ghent, 29 Aug 1862. He was educated in a Jesuit school in Belgium, then studied law, was admitted to the bar in 1887, but was from the first more interested in letters, and in 1896 settled in Paris as an author His work may be divided into three parts,—his lyric verse, his dramas and his philosophical essays. Of the first the two volumes 'Serres Chaudes' (1889) and 'Douze Chansons' (1896) are representative Maeterlinck's verse is imaginative, but lacks in any strong degree the melodic quality. His dramas strong degree the melodic quality. His dramas are 'La Princesse Maleine' (1889); 'Les Aveugles' (1890); 'L'Intruse' (1890); 'Les Sept Princesses' (1891); 'Pélleas et Mélisande' (1892), 'Alladine et Palamides' (1894); 'La Mort de Tintagilles' (1894); Aglavaine et Sélysette' (1896); 'Ariadne et Barbebleu' (1899); 'Sœur Béatrice' (1899); and 'Monna Vanna' (1902), 'Jayzelle' (1903); 'The Blue Bird,' a sublimated Fairy Tale (1909); 'Mary Magdalene' (1910); 'The Death of Tintagiles' (1913); 'The Power of the Dead' (1923) Several have been translated by Richard Hovey (qv.), and 'Monna Vanna' was rendered by (q v.), and 'Monna Vanna' was rendered by Alexis I. du P. Coleman The dramas are Maeterlinck's most striking work. Their eery symbolism can hardly be explained, but must be appreciated at first hand. Though they inaugurated a new theatric school—the 'Drame Intime'—they are properly reading plays, and lose their subtlety, mystic qualities and impressiveness in presentation. 'Pélleas et Mélisande' was given in the United States by Mrs. Patrick Campbell. To many the essays are his ultimate test as a force in literature, the most interesting things that Maeterlinck has done The volumes are 'Le Trésor des Humbles' (1896); 'La Sagesse et la Destinée' (1898), and 'La Vie des Abeilles' Destinee' (1898), and 'La Vie des Adellies' (1902); 'Le double jardin' (1904); 'Mon chien' (1906); 'L'Intelligence des Fleurs' (1907); 'La Mort' (1913); 'The Unknown Guest' (1914); 'The Wrack of the Storm' (1916); 'Betrothal' (1918); 'The Burgomaster of Stilemonde' (1918); 'The Septiage days in Montayra (1918); 'The Burgomaster of Stilemonde' (1918); 'Les Sentiers dans la Montayne' (1919); 'The Great Secret.' He visited the United States in 1921. See under headings Monna Vanna; Pelleas et Mélisande. Consult Harry, 'Maurice Maeterlinck; a Biographical Study' (1910); Thomas, 'Maurice Maeterlinck' (1911); Sturgis, 'The Philosophy of Maeterlinck' (1914); Clark, 'Maurice Maeterlinck: Poet and Philosopher' (1915); Courtney, 'Development of M. Maeterlinck' (1904).

MAEVIAD AND BAVIAD. See BAVIAD.

MAFEKING, må-fä-king' or måf'ë-king,
Cape Colony, a former Bechuana settlement,
now a town, the administrative seat of the

Bechuanaland protectorate, close to the borders of the Transvaal, 870 miles by rail northeast of Cape Town and about 200 miles west-southwest of Pretoria The town stands near the upper Malopo River, is 4,194 feet above sea-level and contains several substantial buildings, including a Masonic temple, a town-hall and a hospital and there is a good water-supply and a race-course Mafeking sustained a protracted siege during the South African War of 1899–1901. It was isolated in October of the former year and was brilliantly defended by a small force under Colonel (now General) Baden-Powell, until relieved by Colonel Mahon in May 1900.

MAFFEI, Francesco Scipione, MARCHESE DI, Italian dramatist and scientist: b. Verona, 1 June 1675; d there, 11 Feb 1755. He studied at the Jesuit College, Parma, for five years and from 1698 at Rome. He was present at the battle of Hochstadt in 1704, taking part in the Bavarian campaign as a volunteer under his brother, Gen Alessandro Maffei. He commenced a literary career in 1710 by the publica-tion of 'Della scienza cavalleresca,' noted for a censure of duelling; became associated in founding the Giornale dei litterati, and edited with introductions some of the best plays of the Cinque cento In 1713 appeared his own play 'Merope,' since frequently reprinted, one of the most brilliant successes achieved in the history of dramatic literature. While it lacks a love motif, it is considered a masterpiece of Italian tragedy Voltaire adapted it for the French stage, declaring it "worthy of the most glorious days of Athens," and it inspired Home's celebrated English drama 'Douglas' His versatility and scientific attainments are shown in subsequent work which include 'Teatro italiana' (1723-25); 'Istoria diplomatica' (Mantua 1727); 'Le Ceremonie' a comedy (1728); and 'Verona illustrata' (1732). From 1732 he spent four years in travel in France and England, returning by way of Holland and Germany, and wrote 'Galliæ Antiquitates' (Paris 1733); 'Istoria teologica' (Trent 1742); 'Dell impiego del denaro' (1746), justifying loans on interest; and 'Arte magica' (1749-54). He was also associated with Maratori in the great collection of the 'Rerum italicarum scriptores' which occupied 15 years and were published in 25 folio volumes (1723–38). A complete edition of Maffei's works were published in 21 volumes (Venice 1790); and selected 'Opusculi litterari' (Venice 1829; Milan 1844) Milan 1844). See Merope

MAFFITT, John Newland, American clergyman: b. Dublin, Ireland, 28 Dec. 1794; d. Mobile, Ala., 28 May 1850. He was a Wesleyan preacher in Ireland and in 1819 emigrated to the United States, where he became a member of the New England Methodist Episcopal conference. He founded the 'Western Methodist' in Nashville in 1833 and conducted revivalist meetings throughout the South and West. In 1837 he became professor of elocution and belles-lettres at La Grange College, Louisiana, and in 1841 he was elected chaplain to Congress. He published several religious works, also an autobiography.

MAFFITT, John Newland, American naval officer: b. at sea, 1819; d. Wilmington, N. C., 1866. He enlisted in the United States navy in 1832 and in 1861 entered the service of

the Confederacy where he took rank as commodore. In command of the Florada he rendered himself valuable to the Confederate cause, taking many prizes and damaging seriously United States commerce. Owing to ill-health he resigned before the end of the war.

MAFIA, ma-fē'a, a Sicilian secret society similar to the Camorra (qv.), which has long existed in Naples, but much more powerful. The Mafia is essentially a form of organized lawlessness, but its organization is sufficiently elastic to baffle all the attempts of the government to suppress it. It is generally said to have had its origin in the compagni d'armi, a kind of police organized in Sicily early in the 19th century and dissolved by Gairbaldi in 1860 Its members, who are required to prove their daring in a knife duel, are bound never to carry their suits to the regular courts or to give evidence before them. The Italian government has for many years attempted to curb the activities and power of the Mafia, and has to a degree succeeded. In 1902 one of its leaders, Baron Palizzolo, was convicted of murder. The influence of the society has been felt among the Italian born population of the United States. In New Orleans it was suspected in 1890 of having caused the murder of the chief of police. The sequel—the lynching of several Italians caused a diplomatic exchange between the Italian and United States governments. Its influence in New York was destroyed only after years of persistent and aggressive effort on the part of the police. Mussolini, following his accession to power in Italy, sought to destroy the influence of the Mafia, with some success. Consult Alongi, G., 'La Mafia' (Turin 1886; 2d ed, Palermo 1904); Calou, E. C., 'La Mafia' (Madrid 1905); Paton, W. A., 'Picturesque Sicily' (1898) turesque Sicily (1898).

MAGALHAES, ma-ga-lyä'ensh, Domingos José Gonçalves DE, VISCONDE DE ARAGUAYA, Brazılian poet and diplomat b. Rio de Janiero, 13 Aug. 1811; d Rome, Italy, 10 July 1882. He was educated in medicine; but entered upon a diplomatic career in 1836, when he became an attaché at the Brazilian embassy at Paris. He was Minister to Austria in 1859-67, and Ambassador to the United States m 1867-71. At the time of his death he was Ambassador at Rome. He began the writing of verse at an early age and attained a considerable reputation, being regarded as the leader of the romantic school of Brazilian poetry. Among his more important works are 'Suspiros poeticas' (1836); and 'A confederação dos Tamoyos' (1857). His 'Obras completas' were published (Paris 1864).

MAGALHÁES, Fernão de. See Magellan, Ferdinand

MAGALLANES, mä-gal-ya'nes, Chile, a territory lying south of the department of Chiloe, and including the many islands, large and small, along the western and southern coasts of Chile. Its entire area is about 46,000 square miles. Among the more prominent islands in the territory are the Wellington group, Hanover group, Queen Adelaide Archipelago, Madre de Dios and a part of Tierra del Fuego. The mainland is a narrow strip of mountainous sea-coast. The islands are barren; there are extensive forests on the mainland, but very little agricultural land. The climate

is disagreeable and stormy. The animal life is not abundant, the seal and sea-otter frequent the coast and in the sheltered regions east of the Andes cattle, horses and sheep are Coal has been found in the southern part and there are also copper and gold mines The capital is Punta Arenas Pop 29,000.

MAGDA. Sudermann's 'Heimat' ("Home") was the sensation of the theatrical season 1889-90 in Berlin, and the play, either in the original German or in translations commonly bearing the title 'Magda'—the name of the heroine is probably to be regarded as the most widely known and the most successful drama of the end of the century Its success is traceable to at least four causes: its theme of revolt against paternal tyranny is one to which the times were sympathetic, its construction is skilful and in every sense theatrical, it contains a number of picturesque episodes and amusing characters, and is distinguished for animated dialogue; but most of all, its heroine is an unconventional, self-assertive, and emotional "new woman" who affords an actress an unusual opportunity for temperamental display. The technique is a clever combination of the naturalism of Ibsen and the methods of the drame à thèse familiar in the works of Dumas fils The conventional raisonneur — in the person of the Pastor Heffterdingk - mediates between Magda and her father, and debates with each the problems presented by the situation of a prodigal daughter who returns home after a life of moral irregularity but operatic success. We are bidden to despise respectability and admire independence But the representative of each side is far from being an acceptable champion. Magda's father fails to recognize the difference between a child with duties and a human being with rights, and Magda reveals no conception of the fact that duty is only in part a social obligation and is in its innermost essence an obliga-tion of self-respect Translated by C. E. A Winslow (Boston 1896); edited by F. G. G. Winslow (Boston 1909).

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MAGDALA, mag'da-la, or MAKDALA, Abyssinia, fortified town on the plateau of Talanto in Shoa, 72 miles northeast of Debra Tabor. The original fort was built on an isolated rock 3,300 feet above the Beshilo, and was stormed and wholly destroyed by the British troops under Sir Robert Napier 13 April 1868, Sir Robert becoming Baron Napier of Magdala in recognition of the achievement. The natural strategic advantages of the position, however, caused the fort to be rebuilt and the town has acquired considerable im-portance. Altitude, 9,110 feet. Pop. about 4,000.

MAGDALEN, măg'da-lĕn, a name applied to one of the Marys in the Gospels, derived from her place of birth, or former residence, in order to distinguish her from other women of that name (Matt. xxvii, 56, 61; Mark xv, 40, 47; Luke viii, 2; John xix, 25).

MAGDALEN (môd'lin) COLLEGE, Oxford, England, originated in Magdalen Hall, founded in 1448 by William Patten, commonly called William of Waynslete, from the place of

his birth, bishop of Winchester and Lord Highchancellor of England, who 10 years later added the College of Saint Mary Magdalen In some respects Magdalen is the most noteworthy college of the university Five of the fellowships are attached to five Waynflete professorships, of moral philosophy, chemistry, mineralogy, physiology and pure mathematics, established in lieu of the three former lectureships of divinity, moral philosophy and natural philosophy. There is also a professorship of botany. The buildings are noted for their beauty and occupy extensive grounds Among Magdalen's occupy extensive grounds Among Magdalen's celebrated alumni are Addison, Camden, Foxe, Gibbon, Hampden, John Lyly, Sacheverell, Selborne, Tyndale and Cardinal Wolsey. Consult Wilson, 'Magdalen College' (1899); Glasgow, 'Sketches of Magdalen College' (1901)

MAGDALEN (măg'da-lĕn) ISLANDS Quebec, Canada, near the centre of the Gulf of Saint Lawrence, 54 miles northwest of Cape Breton, Nova Scotia, and 100 miles southwest of Newfoundland. Amherst, Alright, Coffin, Wolf, Grindstone, Deadman, Entry and Byron islands compose the group which are politically attached to the district of Gaspé, Quebec. The inhabitants exist chiefly by the fisheries of the adjacent waters; gypsum which is found in veins and hollows, and grindstones from Grindstone Island, are exported. House Harbor on Alright Island, and Amherst where there is a custom house, are the chief settlements. Pop. about 5,000.

MAGDALENA, mag-da-lā'nā, a river of Colombia, South America, which has its rise in the Andes Mountains in the southwestern part of Colombia, and flows north to the Caribbean Sea. A short distance from the sea, at the city of Barranquilla, the river divides and discharges its waters through two channels. It is about 1,000 miles in length. It is navigable for ocean steamers to La Dorada, 592 miles from Barranquilla, and for small steamers to about 900 miles from its mouth. Magdalena River is the principal route from the sea to the interior of the country, and the work of clearing and canalizing both the upper and lower parts of the stream has greatly increased its importance and value as a means of communication and transportation. Bogota (qv), the capital, is largely dependent upon this river for means of communication with places on the coast. The largest tributary is Cauca, whose source is near that of the Magdalena, and part of its course is almost parallel with the main river. Short railroads connect some of the interior towns with the river and its tributaries.

MAGDALENA (mag-da-le'na) BAY, an inlet on the west coast of Lower California, in Mexico, one of the best harbors on the Pacific Coast. The inlet or arm of the sea is about 40 miles long and 12 miles wide and is protected by a long, low sand-bar. A town of the same name is situated on the harbor of the same name is situated on the harbor.

MAGDALENE (măg'da-lĕn) COLLEGE, Cambridge, England, was founded in 1542 by Thomas, Baron Audley of Walden, in place of Buckingham College, established by Edward, Duke of Buckingham, in 1519, which had succeeded a monks' hostel for students founded in 1428. There are seven open fellowships on the foundation, and '? open scholarships. There

are also several exhibitions The annual Pepysian benefaction, value £50, is in the master's gift, and is usually bestowed upon poor and deserving students. The buildings consist of two courts, restored and altered in 1880, a chapel and hall dating from the 15th century and the Pepysian Library, built in 1688 Samuel Pepys, Charles Kingsley and Charles Stewart Parnell were educated at Magdalene College

MAGDALENIAN STAGE, a period in the history of Paleolithic man in southwestern Europe when humanity lived largely in caves (wherefore these people are called "cave men") They had attained a remarkably high degree of skill in the graphic arts, and adorned the interior of caverns with paintings and many objects with engravings of animals and other subjects. See Stone Age

MAGDEBURG, mag'dĕ-boorg, Germany, city, capital of the Prussian province of Saxony, on the Elbe, about 88 miles southwest of Berlin. The manufacturing and trade of Magdeburg are extensive, and its facilities for transportation by water and railroad are excellent Among its industrial establishments are the Gruson Works, noted for their connection with the Krupp Works, the beet-sugar factories and a number of other establishments. It has a large number of excellent schools, gymnasia, a pedagogical seminary, art schools, industrial schools, etc Magdeburg is a place of great antiquity, being a trading centre in the 9th century. It early distinguished itself in the Reformation. During the Thirty Years' War the town was besieged, stormed and sacked by Tilly, when 20,000 persons are said to have been murdered. Pop. (1925) 292,290. Consult Wolter, 'Geschichte der Stadt Magdeburg' (3d ed., Magdeburg 1901); Dodge, 'Gustavus Adolphus' (New York 1906).

MAGDEBURG CENTURIES, a Protestant history of the Christian Church by centuries, written in Latin in 1562 by Matthias Flacius of Magdeburg and other Lutheran theologians. It first appeared as 'Historia ecclesiæ Christi' (7 vols., Basel 1559-74); a German translation of the earlier part also appearing (Jena 1560-65). German Protestant princes bore the cost of publication. The 'Ecclesiastical Annals' of Baronius (q.v) were a Catholic reply to the Magdeburg Centuries. See Protestantism.

MAGDEBURG HEMISPHERES, a celebrated invention of two Lollow hemispheres, made of copper or brass, with their edges accurately fitted to each other, and one of them furnished with a stopcock When the edges are rubbed over with grease, pressed tightly together and the globe thus formed exhausted of air through the cock, the hemispheres, which fell asunder before exhaustion, are now pressed together with immense force. If they are one foot in diameter they will, after exhaustion, be pressed together with a force of nearly a ton. This experiment was first performed by Otto von Guericke of Magdeburg, in 1654, at the imperial Diet at Ratisbon, to the astonishment of the Emperor Ferdinand III and the royal family.

MAGELLAN, ma-jēl'an, Ferdinand (Port. Fernão de Magalhães; Sp. Fernando Magalhães). Portuguese navigator: b. probably at

Villa de Sabroza, Trazos-Montes, about 1480, d Philippine Islands, 27 April 1521 He served in the Indies with distinction, especially at Malacca, and in 1514 saw service in Morocco. In resentment at his treatment by the king, who had not, he thought, duly rewarded his services, he, with Ruy Faleio, a geographer and astionomer, renounced his nationality and offered his services to Spain. Magellan's proposal to seek a western route to the Moluccas was accepted by Charles V, and on 20 Sept 1519 he set sail from San Lucar de Bariameda in command of five vessels He passed through the strait which bears his name (see MAGELLAN, STRAIT of), and on 28 Nov 1520, reached the great ocean which he called the Pacific from its calmness With his three remaining vessels he sailed by way of the Ladrones Islands to the Philippines, discovering Samai on 16 March 1521. He caused the king of Zebu to swear allegiance to Spain, but was killed in a fight with the natives of Matan His vessel, the *Victoria*, under Sebastian del Cano, completed this, the first circumnavigation of the globe. The chief authority for the voyage is a work by Pigafetta, an Italian who accompanied Magellan. Consult Lord Stanley, 'The First Voyage Round the World' (1875); and Guillemard, 'Ferdinand Magellan' (1891).

MAGELLAN, Strait of, the channel which separates the continent of South America from Tierra del Fuego and thus forms a communication between the south Atlantic and the south Pacific oceans. It is upward of 360 miles long, and is of difficult navigation. Its breadth varies exceedingly, the maximum being somewhat over 70 miles. There are a number of bays along the shore and at the southwestern end a group of several small islands. Punta Arenas is the best harbor. The strait was discovered in 1520 by Fernão de Magalhães or Magellan.

MAGELLANIC CLOUDS, in astronomy, called the Nubeculæ, Major and Minor, from their cloud-like appearance, two oval masses of light in the southern hemisphere near the pole; often both visible to the naked eye. Sir J. Herschel describes them as consisting of swarms of stars, clusters and nebulæ of every description.

MAGENDIE, François, fran-swa mazhon-dē, French physician and physiologist b Bordeaux, 15 Oct. 1783; d. Paris, 8 Oct. 1855. He was the pupil of the celebrated surgeon, Boyer, and at 20 was appointed successively aide d'anatomie in the faculty of medicine, and demonstrator. He, however, subsequently devoted himself principally to the practice of medicine, was in 1819 elected a member of the Academy of Sciences and in 1831 succeeded Récamier in the chair of anatomy in the College of France, which he retained until his death. As an experimenter in physiology he occupied a high position and his experiments on living animals were at one time so numerous and involved so much suffering to the animals that the French government deemed it necessary to interfere. The results obtained, however, were of great importance, if they do not absolve him from the charge of cruelty. Among them may be named an original demonstration that the two roots of the spinal nerves are devoted to two separate functions; that the veins are organs of absorption; that strychnine acts upon the spinal cord and contracts by tetanic spasm the nerves of respiration, thus inducing asphixia; that food destitute of nitrogen is not nutritious, and that prussic acid is a valuable remedy in certain forms of cough arising from irritation in the lungs. He was a prolific author of medical works, the most important of which are 'Formulaire pour la préparation et emploi de plusieurs nouveaux médicaments' (1821), containing an account of the effects of certain plants then recently introduced into the materia medica, and which has been translated into all the languages of Europe; 'Précis élémentaire de physiologie' (1816–17), for many years an important manual for students; 'Leçons sur les phénomènes physiques de la vie' (1836–42); 'Leçons sur les fonctions et les maladies du système nerveux' (1839); 'Leçons sur le Sang' (1839); 'Recherches philosophiques et cliniques sur le liquide cephalorachidien ou cérébrospinal' (1842).

MAGENTA, ma-jen'ta, Italy, town in the province of Milan, 16 miles west of Milan, is situated in a grape region, in which the cultivation of grapes and mulberries and the manufacture of wine are the principal industries. Considerable raw silk is exported. It was the scene of a famous engagement 4 June 1859 between the French and Sardinian forces and the Austrians. The Austrians were defeated, largely through the superior tactics of General MacMahon of the French army Pop. about 10,000

MAGENTA, or ANILINE RED, a coaltar dye, which consists of a mixture of the hydrochlorides of rosaniline and para-rosaniline. (See Rosaniline). It may be prepared from aniline oil by digesting the aniline with arsenic acid or with nitrobenzene and ferrous chloride When the oxidation is complete the rosaniline hydrochloride is precipitated by the addition of common salt in large excess, the hydrochloride being formed by double decomposition and thrown down because it is but sparingly soluble in salt solutions Consult Benedikt, 'Chemistry of the Coal-Tar Colors.'

MAGGIORE, mad'jō'rĕ, Lake, one of the largest lakes in Italy, the Lacus Verbanus of the Romans, is situated for the most part in Italy, but also partly in the Swiss canton of Ticino. It is 39 miles in length and varies in breadth from one-half mile to five and one-half miles. It is 646 feet above the level of the sea and has a maximum depth of 1,158 feet. The river Ticino flows through it. In the southwestern expansion of the lake are the Borromean Isles (q.v). On the north and west it is surrounded by granitic mountains, 7,000 feet high, on the south and east by vineyard-covered hills. On its shore are a large number of villages and cities noted for beautiful scenery and historic connections.

MAGGOT, the larva of a fly. (See FLIES).

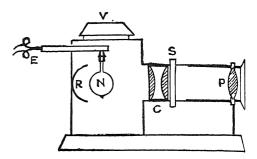
MAGI, mā'jī (Lat. Magus, Gr. Mayos),
an Accadian term recently brought to light by
Assyrian scholars; Accadian being the language of the people of Babylon and Media. The
word signifies "august," "reverend," and was
the title of their learned and priestly caste.
The Semitic nations afterward dominant in
Babylonia and Assyria adopted the learning and
many of the religious observances of the early
inhabitants, as also the name for the learned
caste; and out of the Semitic form the Greeks

made magos. Under the Persian Empire the magi were not only the "keepers of the sacred things, the learned of the people, the philosophers and servants of God," but also diviners and mantics, augurs and astrologers. They were held in the highest reverence, and no transaction of importance took place without or against their advice Hence their almost unbounded influence in both private and public life. Apart from the education of the young princes being in their hands, they were the constant companions of the ruling monarch. Zoroaster, in the course of his great religious reform, reorganized the body of the magi. chiefly by reinforcing the ancient laws as to their manner and mode of life, which was to be one of the simplest and severest, befitting their sacred station, but which had become one of luxury and indolence, and by reinstituting the original distinction of the three classes of herbeds ("disciples"), mobeds ("masters") and destur mobeds ("complete masters"). The food, especially of the lower class, was to consist only of flour and vegetables; they wore white garments, slept on the ground and were altogether subjected to the most rigorous discipline. The initiation consisted of the most awful and mysterious ceremonies, and was preceded by purification of several months' duration As far as we can learn the principle of good and evil, as represented by Ormazd and Ahriman, was recognized, and belief in the coming of a savior, in the resurrection and in a future life was held Gradually, however, their influence, which was all-powerful during the epoch of the Sassanian kings of Persia, began to wane, and, from being the highest caste, they fell to the rank of wandering jugglers, fortune-tellers and quacks, and gave their name to sleight-of-hand and conjuring tricks But the name seems to have been also current as a generic term for astrologers in the East, as is evidenced by the New Testament narrative of the homage of the Magi to the Infant Christ. According to the narrative (Matt. ii, 1-12) the three wise men came from the East to Jerusalem, led by a star, which at length guided them safely to the place of the Nativity at Bethlehem, where they offered their gifts of gold, frankincense and myrrh As the "Three Kings" their names became celebrated in the Middle Ages, and Bede distinguishes them as Kaspar, Melchior and Balthasar. (See also Parsees; Zoroaster). Consult Cumont, F. V. M., (Oriental Religions in Roman Paganism' (Chicago 1911); id., 'Les mystères de Mithra' (3d ed., Brussels 1913); Moulton, J. H., 'Early Zoroastrianism' (London 1913).

MAGIC, or BLACK ART, was formerly the means of producing supernatural effects with the assistance of evil spirits. Doubtless in very remote time magic and religion were practically one, but the development of mentality brought about a differentiation. The fundamental fact was a strong belief in what was considered supernatural Magic is of a more positive nature, but it carries with it the idea of taboo (q.v.). Supernatural effects were at an early period naturally associated with the exercise of the healing art. In the rudest stage of society this was confined to the women, and naturally arrived at the dignity of a profession in the hands of the older, whom

experience had gifted with superior skill. As their art was for the most part a mystery to themselves, they gradually came to be regarded as objects of fear as much as of hope, and magic medicines became synonymous with poison The sorceress, poisoner and witch were in time reck-oned identical (See WITCHCRAFT) Medica, Persia, and the neighboring countries, famous for their knowledge of astronomy and astrology, are described as the chief seats of the ancient Magi, whose doctrine seems to be, in part, of great antiquity This doctrine represented opposition or strife as the parent and original cause of all things. After the opposition between light and darkness, Ormuzd and Ahriman, was established, the whole series of finite beings, the whole sensual world, proceeded from this constant struggle of light and darkness, good and evil. The change of day and night, light and darkness, the whole series of ages, time itself, is only a consequence of this struggle in which constants light agent. this struggle, in which sometimes light, some-times darkness, appears victorious, until finally light shall conquer for ever. If all finite things stand under the influence of preserving and destroying powers in nature, it is clear that he who could master these powers could dispose at his pleasure of the things subject to them; and the doctrine of the Magians was that by prayer and a true knowledge of those laws of opposition, love and hatred, light and darkness, such power could be obtained; and that thus also it was possible to pry into futurity. But it was believed that as the world became sinful the light of the ancient doctrine of the Magi was obscured, and those who bore the name became at last only evil-disposed sorcerers. One important branch of their art was now the excitement of love by potions and enchantments Their love potions consisted partly of ingredients which are still known to the physicians as stimulants, partly of parts of animals who had died longing for food or air, or the saliva of hungry dogs, and other still more disgusting substances Magic at this period also occupied itself with fortune telling, calling up the dead and bewitching by the look—a superstition which is found existing in the processes against witches in modern times. It can hardly be doubted that the art of the ancient magicians was founded to a considerable degree upon a knowledge of the powers of nature superior to that of the general public. At one time magic was greatly studied in Europe, and many distinguished names are found among its students and professors. The most famous of these are Albertus Magnus, Roger Bacon, Cornelius Agrippa, Michael Nostradamus, John Dee, William Lilly, etc. While magic is a John Dee, William Lilly, etc. While magic is a thing of the past there are still many survivals to be found today among the supersitions held by a large number of individuals. Consult Lang, A., Magic and Religion (New York 1901); Marett, R. R., The Threshold of Religion (New York 1914); Frazer, James G, The Magic Art (New York 1925); Thorndike, Lynn, History of Magic and Experimental Science During the First Thirteen Centuries of Our Era (New York 1929); Mackay, Charles D, Memoirs of Extraordinary Popular Delusions (New York 1929).

MAGIC LANTERN, an instrument used for projecting highly magnified images upon a screen or other adapted surface. A basic type which is shown in the accompanying diagram represents a longitudinal section through a magic lantern fitted with a introgen lamp (N), attached to lighting wires $(I\hat{L})$, and provided with a pair of plano-convex condensing lenses (C). The reflector is indicated at R; the



slot in which the slides are inserted at S; the double convex projecting lens at P; and the ventilating chimney, to carry off excessive heat, at V.

The magic lantern is used to show magnified representations of transparent pictures painted or photographed on glass. The projection is said to be diascopic if the light traverses the object and episcopic if by reflected light. The size of the image will depend upon the brilliancy of the light, hence the circle which it is capable of illuminating. Secondarily the size will depend upon the distance of the lantern from the screen, and the ability to focus the image thereon. See Stereofticon.

MAGIC MIRROR OF JAPAN, some few specimens of the small, round bronze mirrors made in Japan which differ from others by reflecting upon a white screen the raised figures on the back of the mirror when a strong beam of light is thrown upon the polished convex surface. The mirrors are made of bronze with a polished, slightly convex face and the backs are decorated with raised ornaments. The characdecorated with raised ornaments teristics of the magic mirrors was long a mystery, as much to the makers as to others, the peculiarity being apparently accidental. The Japanese themselves, while possessing a reverence for all mirrors, placed no undue value upon the magic mirrors. The Chinese noticed the phe-nomenon as early as the 11th century and gladly paid fabulous prices for such as possessed the trait. The physical nature of the mystery was first revealed by the French physicist, Charles Cléophas Person, in 1847. He observed that the convex surface of the magic mirrors was not uniform, the portions in front of the ornamental figures being plane, and therefore reflecting direct rays, while the convex portions gave divergent rays and so made the reflection of the images indistinct. The theory was worked out by W. E. Ayrton and J. Perry, who discovered the phenomenon to be due to peculiarities in the composition of the metal in some of the mirrors, the pressure used in polishing the thicker portions containing the raised ornaments resulting in a difference on the reflecting surface too minute to affect the reflection under ordinary light, but plainly apparent when thrown on a screen by a bright light.

MAGIC MOUNTAIN, The. In this long and brilliant novel (1924) Thomas Mann (q v) paints a symbolic picture of the dissonance and struggle between two seemingly irreconcilable forces in man's nature, the hypnotic lure of the esthetic, estranging the artist and the abstract thinker from the practical world of reality and robbing him of the strength for action, on the one hand, and on the other his sense of responsibility to that world and his longing for association with the commonplace activities and people of the world of reality. In this dualism Mann sees the disease which afflicted the German middle class before World War I

In a luxurious tuberculosis sanitarium on a high mountain in Switzerland a group of characters from all parts of the world is gathered, from as far west as Daghestan, from the Graeco-Roman world of Mediterranean culture, from Holland, Germany and elsewhere Into this motley assembly comes the hero, or rather the central figure (for he is designedly represented as a very ordinary bourgeois individual), Hans Castorp, not at first as a patient. He comes to visit a cousin, planning to stay three weeks, and remains seven years. The author's choice of scene was in itself an almost magical stroke of genius, for the rarified air of the mountain, the boundless horizons of snow, the enforced mactivity of the patients, and the disease itself convincingly symbolize the remoteness from the real world below (the Flatland) and suggest the devitalizing effect of a life of exclusively romantic, esthetic, or metaphysical speculation.

Hans Castorp is constantly exposed to the impact of the divergent attitudes of these characters toward life, chiefly by way of dialectic exchanges and conversations rather than action, for there is no plot in the usual sense Each of them tries to persuade Hans toward his own particular way of life: the practical realist, the humanist, the romanticist, the sensualist, etc. As they come and go (the scene being what it is, Hans repeatedly finds himself beside a deathbed) his vacillation persists, until, with the outbreak of World War I, he hurries down to the Flatland to fight for his country, his resolve suggesting that he has after all maintained something of a balance between the "two souls that dwell within his breast."

The novel ends on a questioning note which Mann himself calls "the philosophic renunciation

MAGIC SKIN, The or WILD ASS'SKIN (Fr. La Peau de Chagrin), one of the most famous of the novels which make up the imposing series of The Human Comedy (La Comédie Humaine) by Honoré de Balzac (qv). It was also one of the earliest (1831). While it offers abundantly that penetrating observation of human conduct and character and that minute record of the myriad little concrete details of circumstance and environment that condition and explain them, that mark the realism of Balzac and make his work so full of what the French critic Hippolyte Adolphe Taine called "human documents," it is essentially an allegory and en-forces, under the form of a magic symbol, a profoundly moral truth. The magic skin is a piece of shagreen bearing this inscription: "Possessing me thou shalt possess all things, but thy life is mine, for God hath so willed it. Wish and thy wishes shall be fulfilled; but measure thy desires, according to the life that is in thee. This is thy life, with each wish I must shrink even as thy own days Wilt thou have me? Take me. God will hearken unto thee So be it." The young man who becomes the possessor of this talisman in a moment of suicidal desperation demands of it a princely fortune and sees himself with the power to have every wish gratified. With each exercise of his power, however, he observes with horror that the magic skin continuously shrinks and that his demands on its power bring with them less and less satisfaction. story is not of even interest throughout, and the narrative of the youth of the hero, which takes up half of the book, may seem somewhat long drawn out. But it is one of the best examples of Balzac's peculiar power of seeing facts and illuminating them with ideas

See also Alkahest, The; Auberge Rouge L'; Chouans, The; Comédie Humaine, La; Eugénie Grandet; Cesar Birotteau; and Père

GORIOT.

ARTHUR G. CANFIELD,
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"Poems of Victor Hugo," and "Life and Works of Honoré de Balzac."

MAGIC SQUARES. A magic square is a square divided into equal smaller squares, each containing a term of a series of integers, the sums of the numbers in any horizontal, vertical

A									
3	4	1	5	2					
2	3	4	1	5					
5	2	3	4	1					
/	5	2	3	4					
4	1	5	2	3					

15	0	20	5	10						
0	20	5	10	15						
20	ላ	10	15	0						
5	10	15	0	20						
10	15	0	20	5						

/8	4	21	10	12
Z	25	9	//	20
25	7	13	19	1
6	15	17	3	24
14	16	15	22	8
	2 25	2 25 25 7 6 15	2 25 9 25 7 13 6 15 17	2 25 9 25 7 3 9 6 5 7 3

of much that I once loved . . . a book of pedagogic self-discipline." See also BUDDENBROOKS, THE, and JOSEPH AND HIS BROTHERS.

Wilhelm A. Braun,
Professor Emeritus of Germanic Languages and
Literature, Columbia University.

and diagonal line being the same.

The construction of such squares is an amusement of great antiquity. They were known in India and China before the Christian Era, and a knowledge of them was introduced into Europe by Moschopulus who flourished in

Constantinople early in the 15th century. Talismanic virtues and occult properties were ascribed to them by the ancients They were engraved on metal and stone and worn as amulets, as in India at the present day. A magic square of the fourth order is engraved on the gate of the fort at Gwallor in that country Mediæval astrologers and physicians were filled with superstitions in regard to magic squares They associated the squares of the orders 3, 4, 5, 6, 7, 8 and 9 with the astrological planets Saturn, Jupiter, Mars, the Sun, Venus, Mercury and the Moon. A square containing one cell symbolized the unity of the Deity; one of the second order, not being possible, signified the imperfection of the elements air, earth, fire and water. Albert Durer's well-known painting, 'Melancholy,' contains a magic square of the fourth order, doubtless because of its supposed mystical significance They have been made the subject of elaborate research by various investigators but the world is indebted chiefly to the French mathematicians for the development of the theory of magic squares.

In this article general rules for the construction of magic squares of any order will be given, illustrated by particular examples. The squares produced by these methods by no means exhaust all possible arrangements, but the rules furnish squares in great number and variety

Magic squares are divided into two general classes according as the numbers of cells on a side is odd or even Even squares are subdivided into doubly even, i.e., when the root is divisible by 4, and singly even, when the root is divisible by 2 but not by 4. A horizontal line of cells is called a row, and a vertical line a column. Two cells in a row equidistant from the ends are termed a horizontal pair, and two cells in a column equidistant from the ends are termed a vertical pair. In a series of natural numbers any two equidistant from the ends are said to be complementary

Magic Squares of an Odd Order.—La Hire's method for constructing odd magic squares requires the formation of two auxiliary squares A and B. For a square of the fifth order diagram A is formed with the series of natural numbers 1, 2, 3, 4 and 5 as follows: First, put 3 (the mean of the numbers) in the top left-hand corner cell, and the numbers 1, 2, 4 and 5 in the cells of the top row in any order. Next, the number in each cell of the top row is repeated in the cells of a diagonal sloping downward to the right The cells filled by the same number form a broken diagonal.

Form a new square by making the left-hand column of A (beginning with its bottom number) the first row in the new square, and so on Next, instead of the numbers 1, 2, 3, 4 and 5, substitute respectively the numbers 0, 5, 10, 15 and 20, thus producing square B In each cell of square C place the sum of the numbers in similarly situated cells of squares A and B The result is a magic square of the fifth order Any magic square of an odd order can be constructed in a similar manner

La Loubére's Method.—In order to construct a magic square of an odd order by this method, place 1 in the middle cell of the upper row, and using the series of natural numbers (any arithmetical series will answer) proceed always diagonally upward to the right, except when the edge of the square or a cell already filled is reached. When a number would fall

			D		_	
30	39	48	1	10	19	28
38	47	7	9	18	27	29
46	6	8	17	26	35	37
5	14	16	25	34	36	45
13	15	24	33	42	44	4
21	23	32	41	43	3	12
22	51	40	49	Z	11	20

outside the square, carry it to the extreme cell in that row or column in which the cell outside would fall. When a cell is reached that is already filled or when the righthand upper corner cell is reached, place the number in the cell just below. The magic square D is formed by this rule. It may be remarked here that from any magic square, whether odd or even, a number of other magic squares can be formed by the mere interchange of the row and column which intersect in a diagonal with the row and column which intersect in some other cell in the same diagonal. In this way from each magic square of the fifth order 48 other magic squares can be formed.

Magic Squares of an Even Order.—To construct a magic of the sixth order proceed according to the following rule which is a modified form of a method due to La Hire.

	E										
1	5	4	3	2	6						
6	2	4	3	5	1						
6	5	3	4	2	1						
1	5	3	4	2	6						
6	R	3	4	5	1						
/	2	4	3	5	6						

_										
0	30	30	0	30	0					
				6						
				12						
				18						
6	24	6	6	24	24					
30	0	0	30	0	30					

	5									
1	3 5	34	3	32	6					
30	8	28	27	//	7					
	23									
/3	17	21	22	20	18					
12	26	9	10	29	25					
3/	2	4	33	5	36					

As in his rule for odd squares two auxiliary squares are employed For a square of the sixth order the first auxiliary square E is constructed as follows: First, fill the cells of the

б // /3 Z

two diagonals with the numbers 1, 2, 3, 4, 5 and 6, beginning on the left-hand side Second, and 6, beginning on the left-hand side fill each of the remaining cells of the first column with the same number as that already in two of them or with the complementary number, i.e., with al or a6 in any way, provided that there are the same number of these numbers in the column Third, cells horizontally paired with those in the first column are filled with the complementary numbers Fourth, the remaining cells in the second and third columns are filled in an analogous way to that in which the cells in the first column were filled; and then the cells horizontally paired with them are filled with the complementary numbers serve that in the case of a singly even magic square it will be necessary in constructing E to take care in the second step that in every row at least one cell which is not in a diagonal shall have its vertically paired cell filled with the same number as itself.

The second of the auxiliary squares F is

constructed as follows: Rewrite square E, making another square F in which the left-hand column of E (beginning with its top number) becomes the top row of the new

K

square, the second column of E becomes the second row of the new square, and so on. Then instead of each of the numbers 1, 2, 3, 4, 5 and 6, substitute the corresponding number

from the series 0, 6, 12, 18, 24 and 30. The result is square F. Next, if in each cell of G the sum of the numbers in the corresponding cells of squares E and F be placed, the required magic square is formed.

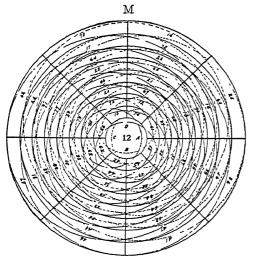
The following method is applicable to the construction of doubly even magic squares only Imagine the square to be divided into squarelets of four cells each, the four central cells comprising one; and conceive these squarelets to be of two kinds, alternating with each other Place I in the left-hand upper corner cell, and proceed horizontally to the right counting a number to each cell, but filling successively the squarelets of one kind only. When the end of one row is reached turn to the left hand cell. of one row is reached turn to the left-hand cell of the next row and again advance, filling cells of one kind as before, and so on. For the

4-square the result of this operation is seen in diagram H

Next, begin with the right-hand lower corner cell, considering 1 as falling on it but not writing the number, and proceed regularly to the left, row after row, filling the empty cells with the numbers belonging to them but not writing numbers in the cells already filled The result of the two operations is the magic square I. This is the most perfect magic square of the fourth order. Not only do the horizontal, vertical and diagonal lines of numbers sum up 34, but there are 38 other ways in which sets of four numbers may be selected whose sum is 34, making 48 ways in all. By the interchange of rows and columns according to the rule enunciated above, other squares may be formed, but none so perfect as this.

The above methods for the construction of magic squares are, in the writer's opinion, the simplest of all those proposed Limited space permits only two other methods to be noticed, which, however, are applicable to only a limited class of cases. The first relates to the construction of composite magic squares. For example a square of 81 cells may be considered as made up of 9 smaller squares each containing 9 cells. The magic square in diagram K is built up by this method

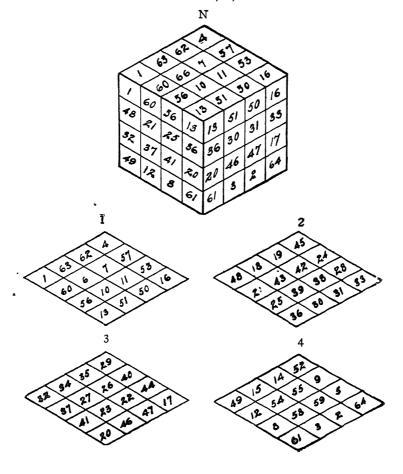
The other method consists in surrounding a magic square with a border of cells, constituting what is termed a concentric square. In this way from the magic square of the third order can be built up squares of any odd order; and similarly even magic squares of any order may be built up from the magic square of the



fourth order. Diagram L is constructed this way
To Dr. Franklin is due the construction of

diagram M which he called The Magic Circle of Circles. (See the illustration herewith). It is composed of a series of numbers from 12 to 75, inclusive, placed in eight concentric circular spaces and arranged in eight radii, with the number 12 in the centre. Like the centre this number is common to all the circular spaces and to all the radii. The numbers are so placed that the sum of all those in any of the circular spaces, together with the cential number 12, is 360, the number of degrees in a circle. The numbers in each radius together with the central number make 360 The numbers in half of any of the circular spaces taken above or below the horizontal diameter, with half the central number, make 180, the number of degrees in a semi-circle. If any four adjoining numbers be taken, as if in a square, in the radial division of the circular spaces, the sum of these with half the central number is 180. There are, moreover, included five sets of other circular spaces bounded by circles which are eccentric with respect to the common centre. The centres of the circles which bound them are at A, B, C and D. The numbers in these eccentric circular spaces possess the same magic properties as the numbers in the first-mentioned circular spaces.

Magic squares have been developed into figures of three dimensions termed magic cubes Diagram N is a magic cube of the fourth order 1, 2, 3 and 4 are horizontal sections of N



numbered from the top down. There are 52 ranks of numbers in this cube which sum up 130, namely, 16 vertical columns, 16 horizontal rows from front to back, 16 horizontal rows from left to right, and four diagonal lines uniting four pairs of opposite corners. The sum of any two numbers which are diametrically opposite each other and equidistant from the

centre of the cube equals 65; and the sum of the numbers in the 48 sub-squares of four cells each is 130.

Among curiosities in magic construction may be mentioned the following: The square in diagram O is filled with the natural numbers in the path of a knight returning to its starting cell, and possesses the property that the difference of any two numbers equidistant from and on opposite sides of the centre is 18. It is due to Euler, the famous mathematician

to Euler, the famous mathematician
W. S Andrews in his Magic Squares and
Cubes gives a magic cross filled with 145
numbers, with the statement that it contains the
almost incredible number of 160,144 different
columns of 21 numbers whose sum is 1,471.

A certain class of magic squares has received much attention in recent years. They are called *Nasik squares* in England, and in France diabolic squares They are formed so that the sums along certain lines, such as all the rows, columns, diagonals and broken diagonals are the same. Diagram P is a unique example, as it is composed entirely of prime

τ

1013	25)	449	911	881
8 39	1301	941	//3	3/1
41	173	701	1229	1361
1091	1289	461	101	563
521	491	953	1151	389

numbers. It is due to the ingenuity of C. D Schuldham and appeared in a recent number of *The New York Sun*.

This square possesses the Nasik properties above mentioned, and in addition the sum of any two numbers equidistant from the centre and opposite each other is 1,402, or twice the central number.

Magic rectangles, crosses, stars, cylinders, etc, have been constructed, but want of space forbids any further notice of them

Varying estimates as to the possible number of magic squares of a given order have been made by different investigators. W. W. Rouse Ball in his Mathematical Recreations thinks that those of the fifth order probably exceed half a million. Theodor Hugel in his Die Magischen Quadrate has calculated that the paper required to contain all the magic squares of the 13th order would cover the whole surface of the earth about 348 times

As to the scientific value of magic squares the following paragraph is quoted from a paper by Maj P. A McMahon, F.R.S., published in Proceedings of the Royal Institution of Great Britain, 1892 "What was at first merely a practice of magicians and talisman makers has now for a long time become the serious study of mathematicians. . . . It was considered possible that some new properties of numbers might be discovered . . . This has in fact proved to be the case, for from a certain point of view the subject has been found to be intimately connected with great departments of science such as the Infinitesimal Calculus, the Calculus of Operations, and the Theory of Groups."

A. B. Nelson.

MAGIC WOOD, a wood used in cups which were sent to Spain in the 16th century as presents to princes, and were highly valued first as curiosities and later as a means of health. The "magic" consisted in the fact that water put into the cup speedily turned a rich blue. Although it has been a subject of inquiry ever since it is not until lately that the wood has been identified botanically, and the cause of its effect on water is still unknown The identification was made by William E Saf-ford, of the United States Department of Agriculture, who described the result of his investigation in *The American Museum Journal* (New York, Vol. XVIII, p. 48, 1918) with a colored illustration. He has discovered that two separate kinds of wood are involved in the history of this matter. The description of the early writers mostly refer to a shrub of Mexico called sweet-wood (Eysenhardtia polystacha); but the cups were made of wood of the gigantic narra tree (Pterocarpus indicus) of the Philippines. Although very different botanically, both produce effects on water virtually indistinguishable; and as in early times most of the communication between Spain and the Philippines was by way of Mexico, the double confusion as to origin easily arose. When water was poured into the narra cups, or chips of the Mexican sweet-wood were infused in a glass, the water became fluorescent in beautiful colors. In the early accounts of the cups (Pterocarpus) it was said that the water at once turned blue, which deepened if left to stand for some time. When this water was poured into a flask and held to the light it appeared perfectly clear, "but if you move this glass phial toward a more shady place the liquid will assume a most delightful greenness, and if to a still more shady place, a reddish color. . dark, however, or in an opaque vase, it will once more assume its blue color." As was customary in those days this changeably tinted water was regarded as having medicinal value, especially in any disorder of the kidneys, and was carried to Europe in great quantities and thus used under the name lignum nephriticum. Mr. Safford got similar colors from the Mexican shrub A few small chips in ordinary tapwater tinged it a golden yellow, which soon deepened to orange. When the glass was held against a dark background the liquid glowed with a beautiful peacock fluorescence very much like that seen in quinine. Placed partly in a sunbeam, half of the liquid appeared yellow and the other half blue; "and when the sunlight was focused upon it by the lens of a common reading-glass the vial seemed to be filled with radiant gold penetrated by a shaft of pure cobalt.» The most ingenious investigation has failed thus far to reveal the cause of this fluorescence.

MAGIE, ma-ge', William Francis, Amer-MAGIE, ma-ge, William Francis, American physicist: b Elizabeth, N. J., 14 Dec. 1858; d. Princeton, N. J., 6 June 1943. Graduating from Princeton in 1879, he afterward studied at the University of Berlin. He was instructor in Physics at Princeton, 1879-84; became professor in 1885; and was dean of the faculty, 1912-25. He was a member of the American Philosophical Society; in 1910 was president of the American Physical Society; and published The Second Law of Thermodynamics (1899): 'A course of Lectures on Physics' (1899); 'A course of Lectures on Physics' (1904); 'Principles of Physics' (1911). He translated Christiansen's 'Elements of Theoretical Physics' (1896), and revised Anthony and Brackett's 'Physics' (1896).

MAGINN, ma-gin', William, Irish author: b. Cork, Ireland, 11 Nov. 1793; d Walton-on-Thames, 20 Aug. 1842 He was graduated from Trinity College, Dublin, m 1811, and was for some years a schoolmaster. In 1819 he became a contributor to Blackwood's Magazine and was in turn Paris correspondent of the Representative, junior editor of the Standard and one of the founders of Fraser's Magazine, his contributions to which made it famous. Consult Krans, 'Irish Life in Irish Fiction' (New York 1903).

MAGINNIS, Charles Donagh, American architect: b. Londonderry, Ireland, 1867. He was educated at Cusack's Academy, Dublin, and won Queen's prize in mathematics at South Kensington, London, in 1883. He came to the United States in 1885, engaged in practice as an architect at Boston in 1886 and became a member of the firm Maginnis and Walsh. He is especially interested in ecclesiastical architecture. He is a member of the Municipal Art Commission, Boston, and of the Massachusetts State Art Commission. He is author of 'Pen Drawing' (1898)

MAGINOT LINE. See Fortifications. MAGISTRATE. See Court.

MAGLIABECCHI, Antonio, än-to'nē-ō māl-yā-běk'ē, Italian bibliographer: b. Florence, 28 Oct. 1633; d. there, 4 July 1714. In the early 28 Oct. 1033; d. there, 4 July 1/14. In the early part of his life he was engaged in the employment of a goldsmith, which he relinquished to devote himself to literary pursuits. Through unremitting application he acquired a multifarious stock of erudition, which made him the wonder of his age. Duke Cosimo III made Magliabecchi keeper of the library which he had collected and gave him free access to the Laucollected and gave him free access to the Lau-rentian Library and the Oriental MSS., and of

the latter collection he published a catalogue, MAGLIONE, Lurgi Cardinal, Catholic churchman and diplomat: b Casoria, Archdiocese of Naples, 2 March 1877. His brother, a priest, supervised his early education. Later he entered a Jesuit school at Naples and from there went to the Gregorian University, Rome. He re-ceived his degrees in philosophy and theology at the Gregorian, and later received his degree in canon law at the University of St. Apollinaris. In 1901 he was ordained priest and in 1905 began a two-year course in preparation for the Vatican a two-year course in preparation for the Vatican diplomatic service at the Academy of Noble Ecclesiastics. In 1908–18 he was professor at the Academy of Noble Ecclesiastics, and in the latter year was sent as representative of the Holy See to Switzerland. In 1920 he was created titular Archbishop of Caesarea in Palestine and was made nuncto to Switzerland. In October 1926, Archbishop Maglione became nuncto to Paris where he remained nine years. His work Paris, where he remained nine years His work in Paris was so appreciated by the French government that he was awarded the Grand Cross of the Legion of Honor. On 16 Dec 1935, Pius XI created him cardinal. Pope Pius sent his red hat for presentation to him by President Albert Lebrun in accordance with accepted custom when affairs at the nunciature prevented his return to the Vatican to receive it. Despite the request of the French government that he be left at Paris, Pope Pius recalled him to Rome and appointed him prefect of the Congregation of the Council. On 11 March 1939, Pope Pius XII appointed Cardinal Maglione his Secretary of State, the office that he himself had occupied under Pius XI. D. Casoria, 22 Aug 1944.

MAGMA, rock which is in a fluid condition due to heat, and commonly said to be molten. For a discussion of the modern conception of a magma see the article on Rocks. See also VOLCANOES and the section on Volcanism in the

article on Geology.

MAGMATIC SEGREGATION. See VEIN, MINING.

MAGMATIC STOPING, the process by which a fluid rock mass (magma) heats the overlying rock till it fractures and portions break off and settle into the magma, there to be assimilated or to remain as solid blocks or Xenoliths. The process is believed to be important in the mechanics of igneous intrusion. See Assimilation and Xenoliths.

MAGMATIC WATER. See GROUND Water.

MAGNA CHARTA, măg'na kär'ta, or GREAT CHARTER OF LIBERTIES, a famous document extorted from King John of England by the confederated barons in 1215. The barons who with their followers composed were the whole nobility of England; their followers comprehended all the yeomanry and free peasantry, and the accession of the capital was a pledge of the adherence of the citizens and burgesses. John had been obliged to yield to this general union, and in June both parties encamped on the plain called Runnymede, be-tween Windsor and Staines, on the banks of the Thames, and conferences were opened be-tween the king and his barons. The preliminaries being agreed upon, the barons presented heads of their grievances and means of redress, in the nature of the bills now offered by both

houses for the royal assent. The king, according to the custom which then and long after prevailed, directed that the articles should be reduced to the form of a charter, in which state it issued as a royal grant. The charter was signed on 15 June Copies were immediately sent to every county or diocese and ordered to be read publicly twice a year To secure the execution of the charter John was compelled to surrender the city and Tower of London, to be held by the barons till 15 August, or until he had completely executed the charter King John, though he signed the charter, had no intention of keeping it; he appealed to the Pope, who in a bull declared Magna Charta "null and void" and excommunicated the barons who had obtained it; and he was conducting a war against his barons when death overtook him in May 1216 Many parts of the charter were pointed against the abuses of the power of the king as lord paramount; the tyrannical exercise of the provisions of the forest laws was checked, and many grievances incident to feudal tenures were mitigated or abolished. But besides these provisions it contains many for the benefit of the people at large, and a few maxims of just government, applicable to all places and times, of which it is hardly possible to overrate the importance of the first promulgation by the supreme authority of these provided that taxes should not be imposed without the consent of the Common Council of the realm The 39th article contains the celebrated clause which forbids arbitrary imprisonment and punishment without lawful trial. This article contains the writ of habeas corpus and the trial by jury, the most effectual securities against oppression which the wisdom of man has devised, and the principle that justice is the debt of every government, which cannot be paid without rendering law cheap, prompt and equal. The provision which directs that the Supreme Civil Court shall be stationary, instead of following the king's person, was an important safeguard of the regularity, accessibility, independence and dignity of public justice in Great Britain Confirmation of the Great Charter was frequently made by English monarchs. Consult Stubbs, 'Constitutional History of England' (1897)

GRÆCIA, **«Great** MAGNA grē'shĭ-a, Greece," the name commonly given in ancient times to that part of southern Italy which was inhabited by Greek colonists Apparently the name was in use as early as the time of Pythagoras (586-506 B.C.) Strabo includes the Greek cities of Sicily under the appellation, but the name refers generally only to the Greek cities in the south of Italy, including those on the shores of the Tarentine Gulf and the Bruttian Peninsula, with Velia, Posidonia and Laus, on the west coast of Lucania. The name was not at first territorial or coextensive with any region, but applied merely to the Greek cities on the coasts, Cumæ was the most ancient of all the Greek settlements in Italy, but from its remote position it was in a great measure isolated from the later Greek settlements. The Achæans were the real colonizers of southern Italy, their first settlement being Sybaris (720 BC). A few years later (708 BC) Spartan colonists founded Tarentum, and to counteract their encroachments the Achæans founded

Metapontum, on the frontier of the territory of the Tarentines, between 700 and 680 BC Locrians founded further south the city known as Locri Epizephyru, nearly contemporary with Crotona (710 Bc) The Chalcidic colony of Rhegium, on the Sicilian Straits, claims to have been more ancient even than Sybaris The Greek cities on the shores of Bruttium and Lucania were, Velia excepted (540 BC.), offshoots from the earlier settlements, and not founded by colonists direct from Greece The founded by colonists direct from Greece The arrival of Pythagoras at Crotona (530 BC) produced a marked change in the cities of Magna Græcia, and led to the introduction of great political changes He and his followers were ultimately expelled from Crotona. Very little of the early history is known The coast cities were essentially mercantile. Trade was well developed, and in the 6th century there was an extensive commerce, especially with Greece. The colonists who pushed to the interior subdued the opposing natives and developed the fertile plains into agricultural settlements. There was a high development of intellectual life. At various times there were temporary alliances among the cities, but never a permanent federation Warfare was common and bitter and to this fact is largely due the decline of the territory. Magna Græcia com-prised the provinces of Campania, Apulia, Iapygia, Lucania and Bruttium

MAGNALIA CHRISTI AMERICANA, mag-nā'li-a kris'tī a-mer-i-kā'na, an 'Ecclesiastical History of New England, from 1620 to 1628,' published by Cotton Mather in 1702. It treats more extensively of the early history of the country than its title seems to indicate, and is divided into seven books: the first treating of the early discoveries of America and the voyage to New England; the second is 'Lives of the Governors'; the third, 'Lives of many Reverend, Learned and Holy Divines'; the fourth, 'Of Harvard University'; the fifth, 'The Faith and the Order in the Church of New England'; the sixth, 'Discoveries and Demonstrations of the Divine Providence in Remarkable Mercies and Judgments on Many Particular Persons'; the seventh, 'Disturbances Given to the Churches of New England' In the sixth book the author gives accounts of the wonders of the invisible world, of worthy people succored when in dire distress, of the sad ending of many wicked ones and of the cases of witchcraft at Salem and other places.

MAGNENTIUS, măg-něn'shi-ŭs, Flavius Popilius, Roman imperial usurper of the West: d 11 Aug 353. Having been entrusted by Constans with a high military command he availed himself of his office to plot the emperor's over-On 18 Jan 350, presenting himself in imperial purple at a great banquet given by one of the conspirators at Autun, he was saluted with the title of Augustus; and assassins sent for the purpose having dispatched Constans, Magnentius was acknowledged as emperor by all the western provinces except Illyria. Constantius, on hearing of his brother's murder, hastened from the confines of Persia and defeated Magnentius (351). These disasters led to the defection of all the countries that had recognized the usurper, who thereupon committed suicide Constantius then became master of the entire empire.

MAGNESIA, the oxide of magnesium, MgO. See MAGNESIUM.

MAGNESITE, a mineral (magnesium carbonate, MgCO₃; carbon dioxide 524 per cent, magnesium oxide 476 per cent theoretically pure) in which silica magnesium compounds, calcium carbonate and iron oxide are always present, with a hardness of 30 to 35 (Mohs scale) and a specific gravity of 3.0-3.1.

Occurrence.—(1) In crystalline form as magnesite marble or "spathic". as a replacement of dolomite MgCa(CO3)2, commonly as a resultant of hydrothermal activity by magnesium solutions associated with granitic intrusives. There are deposits in Manchuria, Russia, Austria, Czecho-slovakia, Brazil, British Columbia, Quebec, Washington, and Nevada. Colors range widely through the effect of oxidized impurities—blue-black, light red, mottled gray, gray to white. (2) As sedi-mentary beds it is cryptocrystalline, dense and exceedingly fine Usually shallow the beds may be of great lateral extent, typical of desert conditions as in San Bernardino and Kern counties, California, and Clark County, Nev. The color is white to gray-white. (3) As veins and replacements in other rocks, notably in the ultrabasic in-trusions of California. Associated with serpentine (H₄Mg₃Sl₂O₉) it occurs in the coastal and Sierra Nevada ranges, also in Baja California (Mex.) and Venezuela deposits. Amorphic, the color is porcelain white.

Uses.—Chiefly for refractory brick and sintered grains as MgO after "dead burning" above 2900° F. The light burned (caustic) powder is used in oxy-chloride flooring especially on ship decks and sintered grains as MgO after "dead burning" above 2900° F. in public buildings, as a fertilizer addition and as a rubber filler. Synthetic magnesia is produced for the same uses from various brines including

sea water

C. S. SARGENT, General Manager, Northwest Magnesite Company.

MAGNESIUM, a metallic element whose compounds are abundant and widely distributed, but which does not occur in nature in the metallic form. Magnesium resembles calcium in its chemical deportment, and the oxides of the two metals were long confused with each other. Metallic magnesium was first prepared by Davy, in 1808, both by electrolysis and by the reduction of white-hot magnesia in an atmosphere of po-ssium vapor. In 1830 Bussy obtained a larger and purer yield of the metal, by heating a mixture of potassium and anhydrous magnesium chloride to redness. It is commercially produced by the electrolysis of the fused anhydrous chloride or the direct reduction of the oxide by ferrosilicon or carbon. Pure magnesium is silvery-white in color, lustrous and moderately silvery-write in color, justious and moderately hard. It may be hammered, rolled, filed and polished. Its specific gravity is 1.74 and its specific heat 0.246. Its melting point is 651° C. When raised to a bright-red heat (out of contact with the air) it volatilizes, depositing upon cool surfaces again in the form of lustrous silvery crustals which belong to the hexagonal wery crystals which belong to the hexagonal system, and are isomorphous with those of zinc; this property has been commercially used in the production of metal of high purity. It expands by 0.000026 of its own length, per Centigrade degree of rise of temperature; and at 20° C. its electrical resistance is 0.0481 of that of mercury.

Chemically, magnesium is a dyad. It has the symbol Mg, and an atomic weight of 24.32. Its

most important compounds are the oxide, MgO the chloride, MgCl₂, the sulphate, MgSO₄, and the carbonate, MgCO₃. Metallic magnesium is not altered upon exposure to dry air, but ordinary air oxidizes it superficially. It dissolves readily in dilute acids, with the formation of the corresponding salts. Chlorine, bromine, iodine, fluorine, sulphur, phosphorus and arsenic combine with it directly. Red-hot metallic magnesium also slowly combines with free nitrogen to form a solid nitride. In the isolation of argon, helium and the other rare gases of the atmosphere advantage is taken of this fact for separating these gases from the nitrogen of the air. (See Argon) When strongly heated in the air, metallic magnesium takes fire and burns with an exceedingly bulliant white light that is rich in chemical rays; the product of the combustion being magnesia, MgO. Advantage is taken of this property in flashlight photography. Magnesium will also burn when sufficiently heated in steam, carbon dioxide or sulphur dioxide.

Magnesium oxide, or "magnesia," MgO, is usually prepared by heating the nitrate or carbonate of the metal; on account of this method of preparation it is commonly known as "calcined magnesia." Magnesia is a white substance, without taste or odor. It does not have a strongly alkaline reaction, but it acts as a powerful base, reacting with acids to form the magnesium salts. It is scarcely soluble in water, but it slowly absorbs moisture and carbon dioxide from the air, becoming converted into a mixture of the hydrate and carbonate. One of the most distinctive characteristics of magnesia is its infusibility, the electric furnace being required to melt it. On account of its infusibility magnesia is used in the manufacture of crucibles and of

firebrick.

Magnesium chloride, MgCl₂, is prepared by dissolving magnesia in hydrochloric acid. This substance is largely used as a preventive of mildew, in the sizing of cotton cloth. The mineral carnallite contains magnesium chloride, having the composition MgCl₃·KCl·6H₄O; the chloride is also recovered from the bitterns, or mother liquors, remaining after the crystallization of salt from brine wells in Michigan, Ohio and West Virginia, and as a byproduct in the recovery of potash from langbeinite (K₂SO₄·2 MgSO₄) in New Mexico. Magnesium sulphate occurs native (in combination with one molecule of water) as kieserite, and it may also be prepared artificially by dissolving magnesium oxide or carbonate in dilute sulphuric acid. When combined with seven molecules of water, magnesium sulphate constitutes the familiar substance known as Epsom salts (q.v.), which is largely used in medicine. Magnesium carbonate, MgCO₈, is a white substance, insoluble in water, but soluble in a solution of ammonium chloride, and also in water that contains carbon dioxide in solution. It occurs in nature as the mineral magnesite, which crystallizes in rhombohedral forms, isomorphous with calcite. Dolomite, which occurs in nature in enormous quantities, is a carbonate of magnesium and calcium.

Magnesium salts are used to a considerable extent in medicine. The name "magnesium" is derived from "magnesia," which substance is said to have been obtained from the province of Magnesia in Thessaly.

Metal Production.—The expansion of the

production of magnesium metal in response to Second World War demands is one of the

miracles of war production.

As an industrial metal, magnesium has been on the market for comparatively only a few years; production in the United States in 1932 was under 400 short tons, but had increased to 6,260 tons in 1940, with corresponding increases in other countries, and a world total in 1940 of about 45,000 tons. At that time these increases were considered phenomenal, but they fade into insignificance in comparison with the performance of the next three years, when mushrooming war demands brought developments in months that normally would have required years.

Nothing very specific is known of progress during this period in countries outside of the United States, but the results accomplished here may be taken as more or less representative of the progress that has been made in the other belligerent countries. However, that Germany and Japan had anticipated the coming war demand for magnesium is evidenced by the fact that the 1940 estimates attribute over half the world total to Germany, one sixth to England, somewhat less to the United States, and the remaining one sixth in decreasing amounts to Japan, France, the Soviet Union, Switzerland, and Italy. To this prewar list, Norway was added in 1941, and Canada, beginning in August 1942, the latter with an output of 3,575 tons in 1943.

While there are other uses for magnesium, air warfare claims the bulk of the output, for plane construction, incendiary bombs, illumina-tion flares, tracer bullets, and similar items. As the field of war expanded, and the American plane construction program was enlarged accordingly, the potential demand for magnesium grew by leaps and bounds; a War Production Board estimated requirement of 550 tons a day was considered almost fantastic for a metal which only a few months earlier was being turned out at a rate of 520 tons per month, but almost before people had time to accustom themselves to the first figure, it was raised to 1,000 tons a day. Confronted with such demands, plant construction was started on an unprecedented scale, to supplement the output of the single prewar producer. This one original producer increased the capacity of its plant and built a second, while another company built a third, while the government financed and built 12 additional plants and doubled the capacity of the second private plant. By the end of 1943 these 15 plants were in production, with a rated capacity of 26,000 tons a month, with a maximum output of 21,000 tons in January 1944, practically double the output rate a year earlier.

This output was not the maximum of which the plants were capable of producing, and was only 70 per cent of the planned output, but as it turned out actual consumption failed to reach the high levels that had been anticipated and by the end of the first quarter of 1944 sufficient surplus had been accumulated to permit a reduction of output. By June 1944 production had been scaled down by 30 per cent, with further cuts in prospect. Total production in 1943 has been reported at 184,000 short tons, with 112,700 tons in the first buffer of 1044.

tons in the first half of 1944.

These 15 magnesium plants use one of three basic processes for the production of the metal: (1) Electrolysis of fused magnesium chloride,

(2) Reduction of magnesium oxide by ferrosilicon,

(3) Reduction of magnesium oxide by carbon. The electrolytic method is preferred, especially if the required chlorides are directly available; if not, the oxide must be converted to chloride. Although the reduction procedure is simple and direct, producing fused magnesium of relatively high purity, the process has the disadvantages of requiring a cell feed of high purity, producing and handling the anhydrous chloride from the hydrated salt; providing means of handling and disposing of the chlorine produced, and providing a large amount of electric power.

The ferrosilicon reduction process is likely to prove somewhat higher in cost, but this is partly offset by the use of the oxide instead of the chloride, and is helped still more by the fact that the oxide need not be pure MgO; a calcined dolomite, containing lime (CaO) works better than the pure MgO. This is due to the fact that the silica (SiO₂) produced by the reduction must be slagged off as a silicate; if pure MgO is used, from one third to one half of the MgO is lost in this way; however, if the cheaper and more plentiful dolomite is used, the CaO does the slagging work, with a corresponding saving of MgO. The calcined dolomite is ground, mixed with ground ferrosilicon, briquetted, and charged into retorts, where they are heated in a vacuum to a temperature of 1100-1200° C. The reduced magnesium is volatilized and recovered as liquid metal in condensers attached to the retorts.

In the carbon reduction a briquetted mixture of MgO and carbon is heated in an electric arc furnace. In this case both products of the reaction are gases—carbon monoxide (CO) and magnesium vapor. If these are permitted to cool normally, the reaction reverses itself, with the reformation of MgO; this can be partially prevented by cooling the mixture to below the reaction temperature so rapidly that the re-oxidation can not be completed. This is done by sweeping the mixed gases out of the furnace with a current of hydrogen or natural gas. Even this does not prevent some reoxidation, and the magnesium vapor condenses as a fine droplet of liquid metal, the surface of each particle being covered with a layer of MgO, which prevents coalescence. To obtain a pure metal this powder is charged into a redistillation furnace, from which the metal is according to later and condenses. which the metal is again volatilized and condensed as liquid metal.

A modification of the carbon reduction method uses calcium carbide as the reducing agent. also possible to use aluminum instead of silicon, but the cost would be prohibitive in a commercial

application.

The primary raw material for the electrolytic process (magnesium chloride) may be obtained from the residual bitterns from salt brine wells, from the mother liquors in the recovery of potash from langbeinite, or if necessary by chemical treatment of magnesium oxide. The oxide used in the thermic reduction processes may be supplied from mineral sources (mostly magnesite, dolomite) but at least two large plants use an elaborate process for the recovery of the 0.1 per cent of MgO in sea water and then converting it to the chloride for electrolysis, in preference to utilizing a relatively higher MgO content in mineral form. (See tables next page.)

TABLE I Estimated World Production of Magnesium, 1938-42, by Countries, in Metric Tons*

Country	1938	1939	1940	1941	1942
Australia Canada France Germany Italy Japan Norway Switzerland U S S R United Kingdom United States	1,800 14,100 102 1,500 750 500 2,200 2,918	2,500 16,500 300 2,000 . 750 1,000 4,831 3,039	2,000 25,000 500 3,000 750 1,500 6,500 5,680	200 3,000 35,000 2,500 1,000 1,000 4,000 12,000 14,782	430 230 3,000 50,000 5,000 12,000 2,000 1,500 16,500 44,418
Total	23,900	30,900	44,900	77,600	140,100

Table II ACTUAL DOMESTIC CONSUMPTION OF PRIMARY AND SECONDARY MAGNESIUM (MAGNESIUM CONTENT), 1941-42, by Uses, in Pounds*

Use	1941	1942	Use	1941	1942
Structural products ¹ Aluminum alloys	21,951,900 6,762,200	14,317,200	Chemicals Other	27,600 32,300	22,900 23,300
Other alloys	59,000 130,400 383,200	² 431,100 211,800 6,000,000	Total	29,346,600	84,525,700

¹ Castings, sheet, extruded shapes, forgings, etc ² Includes 396,100 pounds of magnesium contained in 50-50 aluminum-magnesium alloy.

TABLE III Specified Magnesium Compounds Produced, Sold, and Used, by Producers in the United States, 1943-44†

	1943				1944			
Product	Produced	d Sold 1		Used	Used Produced		Sold 1	
	Short tons	Short tons	Value	Short Short Short tons tons	Value	Short tons		
Precipitated magnesium carbonate		25,795	²\$509,405	²49,462	52,918	4,845	\$448,619	47,917
magnesia and mag- nesium hydroxide Magnesium chloride—100	33,888	3,809	847,583	4	³4,694	4,391	923,695	4
per cent basis Magnesium sulfate — 100	640,708	55,740	1,931,036	587,089	525,223	19,086	712,826	509,365
per cent basis	26,710	26,416	1,320,104		25,316	25,565	1,289,448	

¹ Sales by one producer to an affiliated consumer for immediate use are not included in "Sold" but are reported under "Used."

² Partly estimated.

³ Exclusive of magnesia made from magnesium hydroxide, to avoid duplication.

⁴ Magnesia and magnesium hydroxide used by producing firms in making other magnesias are not shown.

TABLE IV Secondary Magnesium Recovered in the United States, 1943-44, in Short Tonst

Type of product or use	1943	1944
Magnesium-alloy ingot¹ (gross weight). Magnesium-alloy castings (gross weight). In aluminum alloys. In lead alloys. In zinc alloys. Consumed in chemical and incendiary uses.	34	13,379 235 23 2 5 5
Total From new scrap. From old scrap.	11,404 11,254 150	14,185 13,976 209

¹ Figures include secondary magnesium incorporated in primary magnesium ingot.

**Minerals Yearbook, 1942.

†*Mineral Industry Surveys, Bureau of Mines, Mineral Market Reports: June 21 and July 30, 1945.

MAGNESIUM, Electric Production of. See Electrochemical Industries

MAGNETIC DIP, the angle formed with the horizon by a magnetic needle free to move vertically in the plane of the magnetic meridian. It is also called *inclination* and dip of the needle. At the magnetic equator it is 0°, and 90° at the magnetic poles. See DIPPING NEEDLE; DECLINATION NEEDLE; MAGNETISM.

MAGNETIC FIELD. See ELECTRICAL TERMS.

MAGNETIC FLUX. See ELECTRICAL TERMS

MAGNETIC MOMENT. See MAGNET-

MAGNETIC POLE, either of two spots on the earth's surface toward which the compass needle points from any direction throughout adjacent regions. The North Magnetic Pole is at N lat 71°, W long 96°, and the South at S. lat. 72–73°, E long. 156°. See MAGNETISM.

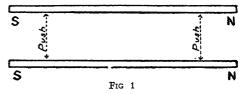
MAGNETIC SEGREGATION, a process or processes in the preparation of ore by which the more valuable minerals are separated from the waste material and from each other by the use of magnets. A usual type of segregator consists of a belt conveyor carrying the ores below the magnet which raises the magnetic ore to another belt traveling at right angles to the first. As it passes out of the magnetic field the segregated ore drops into a receptacle. By weakening or strengthening the magnetic field it becomes an easy matter to separate the non-magnetic from the magnetic, and the weakly magnetic from strongly magnetic.

MAGNETISM, the name applied to a peculiar force action first observed in connection with certain iron ores. This ore, often called lodestone, is supposed to have been discovered in Magnesia, a part of Asia Minor. It is not possible to state just when this discovery was made, but certain passages in Lucretius show that something was known concerning it before the beginning of the Christian era. About the year 1200 we have the statement by Neckham that a lodestone free to turn takes up a definite position in space Some further details were noted by Peregrinus (1269) and Ferrara (1629), but the greatest of the early works is that of Dr. Gilbert, a physician, who published his 'De Magnete' in 1600. Those interested in the history of the subject may consult the 'Intellectual Rise of Electricity' by Park Benjamin, in which an excellent historical sketch may be found.

The only direct evidence that a body is magnetic is its ability to exert a force on certain substances, which, by reason of their susceptibility to this action, are called magnetic substances. A lodestone brought in contact with several small bodies will select those of iron or steel, if such be present, but show no appreciable force on copper, lead, wood or in fact on any except iron, nickel, cobalt, certain rare metals and certain alloys, discovered by Hensler, of relatively non-magnetic metals, and a few others to a lesser degree. Of even greater interest and importance is the fact that the lodestone is able to endow steel or iron with the ability to exert this force. Soft iron loses its

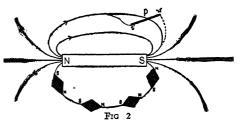
external magnetic qualities when removed from the immediate neighborhood of the exciting source, but hard steel or iron will retain this property for a long time If a bar or rod of hard steel is drawn across a piece of lodestone or other permanent magnet and is then suspended so as to be free to turn about a vertical axis it will take up a definite position, usually its line of greatest length will be approximately north and south. If it be plunged into a box of iron filings, little magnetic action will be manifest near the middle of the bar, but near the ends considerable quantities of filings will be attracted and may be lifted against the action of gravity. These facts led to the naming of the regions of greatest external action the poles of the magnet and since the lines joining these regions would, in the case of a freely suspended magnet, lie in many places nearly north and south, the pole which seeks the north is often called the north-seeking or positive pole, the other which turns toward the south is correspondingly named the south-seeking or negative pole. The entire subject was formerly studied with reference to the behavior of like and unlike poles, and it was even supposed that these poles consisted of opposite sorts of magnetic Later investigations have developed methods less directly dependent upon the idea of. poles, which are preferable for many purposes.

If we suppose two long magnets placed as shown in Fig 1 a study of their mutual force



action would indicate that each is exerting a push tending to increase the distance between them, and that the amount of this repulsion will vary with the distance between the magnets. If one of the bars be replaced by another whose magnetic quality is different the force action will be modified. If one of the magnets be reversed in position a corresponding force tending to reduce the distance between the bars would be observed. It is convenient to use as a preliminary definition the statement that a unit pole is one which would exert unit force upon a precisely equal pole at a distance of one centimeter. The law of pole action can then be stated by saying that the force is equal to the product of the two poles strengths divided by the square of the distance between the poles

If a freely suspended magnet is brought into



the neighborhood of a large bar magnet as indicated in Fig. 2 it will be observed to take up a position somewhat as indicated in the lower

part of this diagram, as its point of suspension is moved along the line. The region where this is moved along the line directive force is noticeable is called the field of the magnet (Gilbert's "orb of virtue"). If continuous lines are drawn, which at each point have the direction taken by the free magnet, these lines are called lines of magnetic force, and they offer a very convenient method for a general study of magnetic action While these lines have no objective existence, it is, nevertheless, desirable to imagine that they are real and that they possess certain definite qualities They should always be considered as being directed away from the north-seeking or positive pole. In the early conception of magnetic action these lines would have been regarded as the lines of flow of the magnetic material, and the word flux, still in use, bears evidence of this conception It is convenient also to regard the lines of force as being under tension and capable of repelling each other. The number of actual lines of force which could be drawn about a magnet is infinite For purposes of comparison, however, it is customary to represent the force action at a point upon the unit pole placed at that point by the number of lines drawn per square centimeter on a surface perpendicular to the field A unit field is one in which a force action upon a unit pole is one dyne, about the weight of 1-1000 of a gramme

In order to compare magnets and to facilitate magnetic computations, certain methods of measurement have been devised. Only a brief sketch can be given here, as full details of these operations may be found in books devoted to this subject, some of which will be men-tioned at the end of this article. When a bar magnet is placed at right angles to the lines of a uniform magnetic field it will experience a a uniform magnetic field it with experience a twist tending to place it along these lines. The amount of this twist will depend upon three things. First The pole strength of the magnet in question Second The distance between the poles. Third: The strength of the field where it is placed. The product of the pole strength by detaces between poles is called the magnetic field. by distance between poles is called the magnetic moment of the magnet. When a magnet is suspended freely and slightly displaced from a position parallel to the lines of force it will vibrate about this position. The time required for a complete swing is found to depend upon the magnetic moment, the moment of inertia and the strength of the field where the magnet is placed. The vibration period may be directly observed and the moment of inertia computed from the dimensions and weight of the magnet. In this way the product of the magnetic moment by the field strength may be found. If the same magnet is held with the line joining its poles east and west it will cause a small freely suspended magnet some distance to the east or west to turn slightly from its equilibrium posi-The amount of this deflection depends on the distance between the magnets and the ratio of magnetic moment to field strength If we denote the magnetic moment by ml and the field strength by H, the product of ml times H is found from the time of vibration, and by means of the deflection of the small auxiliary

magnet \overline{H} may be determined When ml times H or ml divided by H is known either ml or H is readily computed. When the field at any point is known, a comparison of the time of

vibration of a magnet at the known point with its period when vibrating at any other point enables us to compare the two fields without further measurement. The law of change being that if periodic time is doubled the field strength would be four times as great, or the period varies inversely as the square foot of the field

in which the magnet vibrates

The facts mentioned above regarding the ability of a magnet to cause pieces of neutral iron or steel to show magnetic properties is frequently spoken of as magnetic induction. The general phenomena can be readily remembered if we imagine that it is easier for lines of magnetic force to pass through iron than through air Small pieces, as shown at P. Fig. 2, would have lines entering at "S" and leaving at "N" and would behave as small magnets placed in corresponding positions. Owing to the tension of the lines of force these small pieces would tend to set themselves nearly parallel to the undisturbed direction of the lines. If a sheet of glass or other non-magnetic material is placed over a magnet and itom filings are sprinkled on its surface, a slight tapping, sufficient to overcome friction, will enable the lines of force to arrange the small temporary magnets parallel to the field. In this way maps of magnetic fields may be readily found, and their study throws considerable light upon many de-

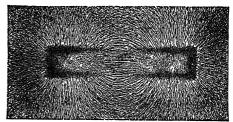


Fig. 3.

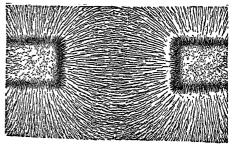


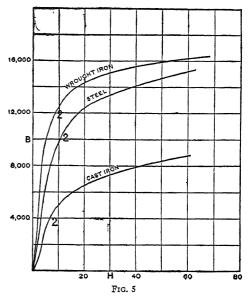
Fig. 4

tails of these peculiar phenomena. Such fields are shown in Figs. 3 and 4. If a sphere of iron or cobalt is free to move in a magnetic field which is not uniform, a tendency is always observed for the iron to place itself in the strongest part of the field, or so that as many of the magnetic lines pass through it as possible. Such a substance is called paramagnetic. Some substances, as for example a sphere of bismuth, will tend to move to the weaker portions of the field, indicating that it is more difficult for magnetic lines to pass through the material than through air. These are called diamagnetic bodies.

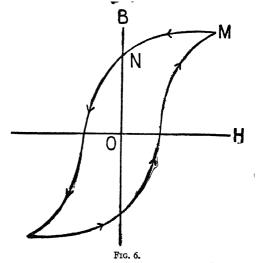
The importance of magnetic action in both theoretical and practical affairs is due largely

to its intimate connection with the phenomena of the electric current In fact it is absolutely impossible under any conditions to have an electric current flow in a conductor without producing a magnetic field In the case of a long straight wire carrying current the magnetic lines are circular in form, concentric with the wire, and their planes are perpendicular to its If a wire is wound in a long, straight, cylindrical coil, frequently called a solenoid, and a current be passed through it, the field produced will be nearly identical with that of a bar magnet, the difference being that the lines of force are entirely in air and are not modified by the peculiar properties of iron By increasing the strength of the current and the number of turns of wire, a comparatively strong magnetic field may be produced at the centre. A piece of soft iron or steel inserted in the coil becomes a powerful temporary magnet, while strips or bars of hardened iron or steel would in the same way become permanent magnets. The requirements of modern electrical processes have led to very careful investigations of the magnetic behavior of iron in connection with the production and the measurement of electric energy. Only a brief sketch of the fundamental features can be given here. If we suppose an electric current flowing in a long solenoid, which does not contain an iron core, the strength of the magnetic field through the inside of the solenoid may be readily computed from a knowledge of the number of turns of wire and the strength of the current. The symbol H is generally used to indicate the field strength when iron is absent If now a bar of iron be inserted it will be found that the magnetic field is greatly increased. The new field will depend partly on the original value of H and partly on the quality and previous magnetic history of the iron inserted. The symbol B is generally used to denote the intensity of the field when iron is present. It may then be stated that B equals μ H, where μ is a variable factor depending on the nature of the iron and the field strength; this factor is called the permeability The original field H is frequently spoken of as the magnetizing field and the new one as the induction. Or H stands for the number of lines per square centimeter where iron is absent and B stands for the number of lines per square centimeter in the iron If iron, in a neutral magnetic condition, is placed in a solenoid and the electric current is gradually increased from zero the iron will be subjected to a steadily increasing magnetizing field comparison of corresponding values of B and H in such a case leads to very important re-The relation between these values is sults. best explained by reference to a curve drawn by using these quantities as co-ordinates Such curves, usually called the curves of magnetiza-tion, are shown in Fig 5 It should be observed that when H is almost zero, the induction is very small, then B increases more and more rapidly with a rising field until at point two the rate of increase of B with H begins to fall off rapidly, and shortly a value of B is reached which cannot be materially increased no matter how strong a magnetizing field is used. For example in the specimens shown it is useless to extend the value of H much above 70, and in actual practice this limit would be taken much lower. When as many lines as possible are car-

ried through the iron it is said to be saturated. The exact shape of the magnetization curve will depend upon the nature and previous magnetic history of the specimen, but the ratio $B\!-\!H$ at any point gives the ability of the iron to multiply magnetic field strength for that particular



field. If, however, any definite state of magnetization is attained as at the point M, Fig 6, it will be found that upon reducing the field, H, the values of the induction, B, will not agree with those found for the same value of H when the field was increasing. In fact if H be changed to zero and then to negative values and back again to the former condition the value of B will form a loop as indicated. This peculiar lag of the induction when the field is



reduced is called hysteresis, and the hysteresis loop as shown is of practical importance because its area enables one to find the work converted into heat when the magnetization is carried through one complete cycle. The line ON measured the residual magnetism, which is

semi-permanent, and will be greater in hard than in soft iron or steel. No matter where the process of magnetization is stopped a series of cyclic changes of the magnetic field always gives

corresponding loops.

A theory due to Weber and later improved by Maxwell which is useful in the correlation of the various phenomena observed in the magnetic behavior of iron is at once suggested by a simple experiment. Take a magnetic steel needle and which shows distinct polarity. Upon being broken into two parts it will be found that instead of securing two isolated poles, that each piece possesses a plus and a minus pole practically identical with the poles of the original needle. Carry this process to any length and each little piece, however small, will be found to possess two poles, one positive and the other negative. If we assume that this process could be carried on to the smallest conceivable particle of the iron is by itself a magnet. We may further suppose that the molecular magnets in a neutral piece of iron are entirely devoid of regular arrangement as regards position of the poles; such a chaotic condition may be indicated roughly by Fig. 7. It may be supposed that these molecular

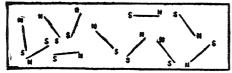
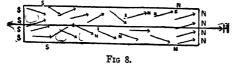


Fig. 7.

magnets are partly held in position by the action of forces analogous to friction, which also tend to hold them in any new position to a greater or less extent in case the original arrangement is disturbed. Under the action of a weak magnetic field these friction forces would prevent the turning of the molecular magnets into paral-lelism with the field lines. As soon as the field is strong enough to overcome this sort of friction we might expect the same tendency to arrangement of these minute magnets that is observed in the case of iron filings in the mapping of magnetic fields. As long as a considerable number of the axes of these molecular magnets make fairly large angles with the field lines the leverage by which turning is produced would be considerable; if however they approach parallelism with each other and the field lines, the effective twisting would be very materially reduced. This would correspond to the approximate saturation of the iron and no considerable change in position could be produced by increasing the field strength. The general arrangement may be indicated approximately in Fig. 8, where



it will be observed that there is a tendency for free positive poles to appear at one end, namely, where the field lines leave the iron, and for uncompensated negative poles to appear at the other end.

The facts in favor of this sort of explanation may perhaps be briefly summarized as follows: (1) the general shape of the mag-

netic curve is explained. (2) As friction of other molecular forces tend to prevent a return to the original chaotic condition after magnetization this arrangement would in part persist after removal from the field, or permanent mag-(3) Soft 1ron netism would be explained should be easier to magnetize and less permanent than hardened in or steel. (4) Jarring as by blows tends to reduce friction and to assist in the process of magnetization and also to reduce permanent magnetism. (5) High molecular activity consequent on rise of temperature decreases magnetic action, in fact, at a dull red heat iron is non-magnetic. (6) Rapid reversals of magnetism involve work against molecular forces and the production of heat, this heat is proportional to the area of the loop. (7) A tube of iron filings or a set of pivoted magnets shows the same behavior in a rising or falling magnetic field as a solid bar. The precise agreement between experimental facts and the indications from theory shown above makes this conception extremely useful. Just why molecules of iron should be permanently endowed with magnetic properties is a subject for specilation which has been indulged in by numerous prominent scientists. It has been supposed for example that electrical currents flow around these molecules, that they consist of vortex rings or that small electrically charged parts are in vibration in such a way as to produce the phenomena of permanent molecular magnetism, The general usefulness of the hypothesis is m no way connected with the truth or falsity of such speculations any more than the facts regarding free fall are dependent on our view of gravitation.

The general statements noted above regarding magnetism of iron are of importance in the manufacture and utilization of magnets for various purposes. Where a considerable amount of permanent magnetism is undesirable, soft iron or steel is always used. For the manufacture ture of permanent magnets special steel is selected and hardened and is then magnetized by its insertion into a solenoid carrying a powerful electric current. Severe shocks or blows are frequently given in order to assist in the molecular rearrangement. The interaction of all the elementary magnets together with temperature changes and machanical shocks will perature changes and mechanical shocks will tend to weaken a magnet. This loss is very considerable at first but finally an almost permanent state is reached. When used in electrical measuring instruments magnets are artificially aged by subjecting them to considerable changes of temperature and a series of mechanical shocks. It should be noted in this connection that the permanence of the magnet will be somewhat increased by joining its poles, when not in use, by a piece of soft iron. The induced magnetism at the ends of the iron helps to hold the poles of the small molecular magnets in position, and counteracts the tendency of these poles to demagnetize the bar.

Aside from the extended use of permanent magnets in electrical instruments their practicable application is comparatively limited. The electro-magnet is widely used where it is desired to cause a temporary force action at a distance from the operator, as for example in the telegraph, etc. Powerful electro-magnets are now frequently used to lift large masses of iron during manufacturing processes. It may

be noted in this connection that the lifting force of a magnetic piece of iron depends on the square of the number of lines per unit area at the contact face. Only so large an area should be used in contact as can be very highly magnetized by the current available. In the construction of dynamos, motors and transformers, the magnetic quality of the iron used is of great importance. The total number of lines set up (flux) must be sufficient for the operations involved and saturation should not be approached in any part. Where the cross section may be made large, cast iron can be used, but where the flux must be concentrated, special soft iron or steel it required. All air gaps are made as small as mechanical and electrical considerations of construction will permit, in order that the required flux may be more easily set up



Fig 9

by the electro-magnets Or as electrical engineers say, the magnetic "reluctance" is made small by use of properly proportioned iron parts and small air gaps in order that the magneto-motive force required may not be excessive

Terrestrial Magnetism.— The statement usually made that a freely suspended magnet needle, remote from magnetic masses, tends to point north and south is not correct except for a few localities at certain times. The actual nature of the earth's magnetic field must be found by extended experiments which are being tarried on by numerous observers largely under the direction of various governments methods of magnetic measurements above) a steel needle be suspended by a silk fibre and carefully balanced so as to hang horizontal and is then magnetized it will be observed to finally come to rest in a certain vertical plane and to be inclined to the horizontal The angle between a horizontal line and the direction of the needle is called the dip, and the angle between the true north and south plane and that in which the needle lies is called the declination. The values of the dip, declination and intensity of the earth's field at a point are called the magnetic elements at that point. The use of the compass both by the surveyor and mariner over nearly the entire surface of the earth makes an accurate knowledge of these elements indispensable In order to convey this information, in a practical way, recourse is had to maps on which places having the same declination, for example, are joined by lines Such maps bring into view many interesting features as regards the earth's magnetism. For example, Fig. 9,

published by the United States Coast and Geodetic Survey for 1900 shows that in northern Oregon, Idaho and Montana the compass pointed approximately 20 degrees east, while in the extreme northeastern part of Maine it pointed about 20 degrees west. Along an irregular line crossing Michigan, Ohio, North and South Carolina and passing east of Cuba the declination was 0, or the needle pointed due north It is evident from an inspection of these maps that the poles of the earth considered as a magnet do not coincide with the geographic poles. The line of no dip follows the equator North of this line the only approximately north end dips down, while at the south it is reversed Some of the minor variations are no doubt caused by local causes, such as masses of magnetic material, but it is a general belief among observers that the earth's magnetism is largely due to outside agencies Another very important point for the mariner, who depends on the compass to find his way in safety across trackless seas or the surveyor anxious to locate landmarks, is that these magnetic elements are continually changing even during the day, as well as month by month and year by year. In London during 232 years the declination changed 35 degrees "A street one mile long laid out in London parallel to the compass direction in 1580 would have its terminus seventenths of a mile too far east according to the compass in 1812." Since 1812 the declination at London has changed from about 24 degrees west to 16 degrees west. In 1580 it was 11 degrees east. In fact it would seem that the magnetic poles of the earth are slowly vibrating. The periods of some of the components of this vibration are astronomical in origin - the day, the year, the lunar month, the sun-spot period, etc. The variation during the day must be taken into account in accurate work as a mile run in the morning and repeated in the afternoon may vary by 5 to 20 feet at its terminus. Sudden changes called magnetic storms also frequently occur, which seem to be associated with atmospheric electrical conditions, sun spots, etc In order to secure data for the study of these complex phenomena, magnetic observatories are maintained where delicate instruments record, day and night, the countless fluctuations of the magnetic forces.

The problem of the navigator is still further complicated by the use of iron ships which are always sources of disturbance, both because of their permanent as well as their variable magnetism. The continual jarring and changes of temperature during a voyage enables the earth's field to continually change the distribution of magnetism in the vessel The means to be used for the correction of this deviation have received the attention of many skilful investigators The limits of this article will hardly allow a discussion of the matter which may be found in special books noted at the end. The contrast between the state of knowledge

The contrast between the state of knowledge regarding magnetism before 1600 and its present development is one of the most striking indications of the growth of scientific investigation. Instead of vague speculations, partial truths veiled in mysticism, more or less direct references to dogma and the supernatural, we have organized knowledge based on experience and constantly checked by experiment and ap-

plication The number of those who believe in "magnetic" healing or, that, because an iron pipe driven in the earth shows polarity, the water flowing through it is magnetic and has special medicinal virtues, is constantly on the decrease. The relations between magnetism and other fields of physical research cannot be treated in this article, yet it may be well to mention that such relations are constantly being investigated and no one in touch with present developments believes that the end is at hand. And it may well be that the delicately poised magnetic needle in some future interpretation of its countless movements will give us a knowledge of the invisible yet all-pervading agency which governs its fluctuations and lead us to a broader generalization of physical phenomena than we can formulate at present. (See Electricity, Electro-Magnetism, etc.). For the optical efrects of magnets in rotating the plane of polarization of light see Light, Polarization

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MAGNETISM, Animal. See Hypnotism.

MAGNETITE, or MAGNETIC IRON ORE, native magnetic oxide of iron, Fe₃O₄. It sometimes has part of its iron replaced by titanium or magnesium, and occasionally by nickel. It is very abundant (the production of the United States in 1929 being 2,401,104 long tons, or about 3 per cent of the iron ore production of the country). When pure it constitutes a valuable ore of iron, 72 per cent of its weight consisting of that metal. Magnetite crystalizes in the isometric system, commonly in octahedra, but also in dodecahedra, with striated faces. It also occurs, and very generally, in massive and granular forms. It is black in color, with a metallic or submetallic lustre. It is brittle, and has a hardness of from 55 to 6.5; the crystals having a specific gravity of about 5.17 It may be readily distinguished by the fact that it is strongly magnetic. Specimens are found which manifest quite a strong, permanent magnetic polarity, this variety of the mineral being known as "lodestone." Magnetite occurs in vast beds in Canada and in the northern and eastern parts of the United States. Abundant deposits of it are also known in California and Washington. It is a common result of segregation in magmas during cooling. See Iron Ores; Magnetic Segregation.

MAGNETO, a device, consisting essentially of a magnet and interrupter, for sending sparks into the ignition system of an automobile. The Eisemann, Bosch and Splitdorf are well-known types. See Automobile.

MAGNETO-ELECTRIC MACHINES. See Electrotherapeutics.

MAGNETO-ELECTRICITY. See Electro-Magnetism

MAGNETOMETER, in its customarily restricted sense, an instrument employed in observatories to determine the intensity of terrestrial magnetism Essentially the instrument consists of a magnetic needle free to swing in a horizontal plane within a circular scale. The magnet may be supported on a fine vertical pivot, or by suspension on a fine untwisted silk thread Bifilar suspension is more to be depended upon; the magnet is supported by two parallel threads and screws enable the tensions in the threads to be equalized and their distance asunder to be adjusted For delicate readings the instrument has been highly refined, a mirror being attached to the magnet, reflecting a beam of light upon a scale. To prevent possible oscillations due to air currents the magnet is enclosed within a box with glass sides, through which it may be observed. A tall tube above the box encloses the suspending thread. The unifilar magnetometer is set up with its magnet lying in the direction of the magnetic The bifilar instrument is set with the meridian magnet at right angles to that meridian-a much more sensitive position. To fill the needs of traveling observers, portable magnetometers have been devised. These are more comprehensive, comprising within a single unit an astronomical telescope with a magnetometer—for the determination of both the magnetic declination and the horizontal intensity; and also a dip circle for the determination of inclination and total intensity. Consult Terrestrial Magnetism, Vol. XVI, page 1, 'Two New Types of Magnetometers'; and Vol. XVIII, page 105, 'Description of the CIW (Carnegie Institution, Washington) Combined Magnetometer and Farth Industry' (September 1013): See Magnetometer Earth Inductor) (September 1913). See Mag-NETISM — Terrestrial

MAGNIFICAT. The words which Mary pronounced when she visited Elizabeth (Luke i, 46-55) begin, Magnificat anima mea dominum ("My soul doth magnify the Lord") Hence the whole of her thanksgiving on this occasion has been called the Magnificat. The present usage of the Roman Catholic Church is to chant or pronounce the Magnificat every day at vespers

MAGNOLIA, Ark., town and Columbia County seat, alt. 312 feet; on the Louisiana and North West Railroad; 50m. SE. of Texarkana; in a farming, lumbering and oil and gas region. Cotton ginning, cotton textiles, cottonseed oil, gasoline refining, and the manufacture of lumber, chairs, mattresses, foundry products and soft drinks are the main industries. Agricultural and Mechanical College (a junior college, opened in 1912) is located here. Settled in the 1840's, it became a town in 1853. Pop. (1930) 3,008; (1940) 4,326.

MAGNOLIA, a genus of ornamental, deciduous or evergreen trees and shrubs of the family Magnoliaceæ. The 35 species are natives

mostly of the United States, India, China and Japan They are characterized by large, alternate entire leaves, large white, purple or pink, sometimes yellowish, solitary, terminal flowers, which are often highly fragrant; and coneshaped, often red, decorative fruits. They are widely planted for ornament in parks and gardens; most of the deciduous species being tolerably hardy as far north as Massachusetts, some even farther north, but the evergreen kinds tender even at Washington, where, however, one species (M. grandistora) can withstand the winters if in protected situations. The wood is close-grained, generally soft, spongy, light and satiny. It is little used because it is not durable, but in Japan one species (M. hypoleuca) is used for lacquering. The bark and the fruits of a few species were formerly employed as stimulants and tonics, but have fallen into disuse

As a rule, magnolias thrive best in rather rich, fairly open, moist, peaty or sandy loams, but generally prove satisfactory upon any garden soil A few, especially the beaver tree (M. glauca), which is also popularly known as sweet, swamp or white bay, are natives of very wet grounds and must be naturally well supplied with water, when planted for ornament They may be propagated by means of layers, by grafts or by seeds planted as soon as ripe or stratified in sand and kept out of doors where they cannot become dry. The plants should be transplanted when the new growth is commencing, otherwise the

operation is frequently unsuccessful.

The following species are among the most generally planted in the United States. The bull bay or big laurel (M. grandiflora) is found naturally from North Carolina to the Gulf States. It is a pyramidal, evergreen tree which often attains heights of 75 feet or more, and is especially conspicuous when in blossom, its fragrant white flowers often attaining a diameter of a foot. The swamp sassafras or sweet bay (M. glauca) ranges from the coast region of Massachusetts to Florida and irregularly southwestward to Texas. It reaches a height of 20 feet and bears fragrant cream-colored flowers. The cucumber trees (q.v.) are natives of the southeastern United States and are particularly attractive because of their pink fruits. Of the exotic species the yulan (M. denudata), a native of China, where it has been cultivated for more than a thousand years, and M. coco, M. bliftora and M. hypoleuca are popular, the first and last particularly. By crossing, hybridizing and selection a large number of choice horticultural varieties have been produced

MAGOFFIN, ma-göf'in, Beriah, American statesman b Harrodsburg, Ky., 18 April 1815; d. there, 28 Feb 1885. He was graduated from Centre College (Danville, Ky), in 1835, from the law school of Transylvania University (Lexington, Ky.) in 1838, entered the practice of law at Jackson, Miss, in 1839, but in the same year returned to Harrodsburg. In 1840 he became police judge, in 1848, 1856 and 1860 was a delegate to the Democratic national conventions, in 1850 was elected to the State senate of Kentucky and in 1859-62 was governor of Kentucky. He refused, 15 April 1861, to comply with Lincoln's call for 75,000 troops; in May 1861 by proclamation warned both the Confederate and Federal governments against oc

cupying Kentucky soil, and the citizens of the State against entering hostilities; and in August requested Lincoln to withdraw United States troops. He vetoed a resolution of the legislature directing him to proclaim the evacuation of Kentucky by the Confederates; but the resolution was passed over his veto. In August 1862 he resigned his office and in 1867 was elected to the lower house of the State legislature

MAGOG, ma'gog, Canada, town in Stanstead County in the province of Quebec, on Lake Memphremagog at its outlet, and on the Canadian Pacific Railroad, about 19 miles southwest of Sherbrooke It has regular daily communications with Newport and other places in Vermont Its industries include textile prints, lumber and butter and cheese making. Magog is a favorite resort for anglers. Pop. (1931) 6,302

MAGOG. See Gog and Magog.

MAGOON, mă-goon, Charles E., American lawyer and administrator: b. Steele County, Minn., 5 Dec. 1861; d. Washington, D. C., 14 Jan. 1920 He was educated at the University of Nebraska, was admitted to the bar in 1882 and engaged in the practice of law at Lincoln, Neb, in 1882-99. He was appointed judge-advocate of the Nebraska National Guard, with rank of major, and in 1899-1904 he was law officer of the Bureau of Insular Affairs at the War Office. He served as general counsel for the Isthmian Canal Commission in 1904-05, and was a member of the commission in 1905-06. He was governor of the Canal Zone from 25 May 1905 until 12 Oct 1906. He was also Envoy Extraordinary and Minister Plenipotentiary to Panama from 7 July 1905 until 12 Oct. 1906. He acted as provisional governor of Cuba from 12 Oct. 1906 until 28 Jan. 1909. Author of 'The Law of Civil Government Under Military Occupation' (1902).

MAGOT. See BARBARY APE; MACAQUE.

MAGPIE (originally pie, the pied or variegated bird, a bird of the genus Pica, closely related to the jays. The genus is distinguished by the extremely long wedge-shaped tail, the middle feathers of which equal the entire length of the head and body, while the outer feathers are less than half as long. The notorious magpie of Europe (P. rustica) is represented in North America by the variety hudsoma, which is rather larger but otherwise similar. The color is a lustrous black with a varied and changing iridescence and sharply varied and changing indescence and snarply contrasting white under parts and patches on the shoulders and wings, the latter being conspicuous as the bird flies. The yellow-billed magpie (P. nuttalli) of California is precisely similar except that the bill and a naked area at its base are yellow instead of black. Other species inhabit Asia and Africa. In America the common magpie is confined to the west, its range reaching from Alaska to Arizona and from the plains to the Cascade Mountains, being especially common in the Rocky Mountains. The magpie is a handsome bird of saucy, vivacious habits and is chiefly noted for its thieving habits and general rascality. It is always engaged in mischief, either in stealing brightly colored or glittering objects from the habita-tions of man or in robbing the nests of other birds, but because of its pert, merry manner is

usually forgiven for the former class of offenses. The caged birds seen in the East give but a faint idea of the beauty and activity of these birds in the wild state. Like the jays the magpies are omnivorous, but less strictly arboreal than the jays. The nest, which is built in a tree or bush, is very ingeniously and substantially constructed. It is a large domed structure protected outwardly by a thick, bristling layer of thorns and twigs, through which a narrow passage opening on one side leads to a deep cup plastered with mud and lined with fibres. Six to nine greenish drab eggs, much spotted and dashed with various shades of brown, are laid. The American magpie is occasionally taken young and made a pet, but it has not the reputation for talking and amusing, albeit thievish, manners, which has made the European bird a favorite from ancient times. Descriptions of its many interesting habits will be found in the books of Coues, Ridgway, Merriam, Cooper, Keyser and other writers upon the ornithology of the western United States.

MAGRATH, ma-grăth, Andrew Gordon, American Confederate governor. b Charleston, S. C; d. there, 9 April 1893. Magrath was the son of an Irish revolutionist of 1798 who escaped to South Carolina. He was educated at South Carolina College (1831) and at the Harvard Law School. He served two terms in the State legislature (1840-44), practised law in Charleston and in 1856 was made Federal district judge by President Pierce In 1861 he resigned, was elected to the South Carolina convention which adopted the ordinance of secession and was then appointed Confederate judge. In December 1864 he became governor of South Carolina. After the war he was imprisoned for several months. He later resumed the practice of law in Charleston.

MAGRATH, William, American painter: b. Cork, Ireland, 20 March 1838 He emigrated to the United States in 1855, and was elected National Academician in 1876 He produced many excellent landscapes and his genre pictures are full of character. Among them may be mentioned 'The Road to Kenmair' (1871), 'The Reveillé' (1873); 'Rustic Courtship' (1877); 'On the Old Sod' (1879), which last is in the New York Metropolitan Museum; 'Paddy on his own Land' (1900); 'Sheep Pasture' (1903); 'The Killarney Country' (1910); 'The Bog of Allen, Ireland' (1911); 'Bog Lands' (1913). Deceased.

MAGRUDER, ma-groo'der, John Bankhead, American soldier: b. Winchester, Va. 15 Aug. 1810; d. Houston, Tex., 19 Feb. 1871. He was graduated at West Point in 1830, served for a short time in the 7th Infantry, then in the artillery. In 1836 he was made first heutenant, saw service in the Seminole War 1837-38 and became captain in 1846. He took an active part in the Mexican War, rising to the rank of lieutenant-colonel, 1847. In 1861, while in garrison at Washington, D. C., he resigned from the United States army, accepted a Confederate colonelcy and commanded the artillery at Richmond. In the same year he won the battle of Big Bethel (q.v.), and was made brigadier-general and majorgeneral. Assigned to the Yorktown district, he fortified the Peninsula and with a force of 12,000 held it against the Army of the Poto-

mac in April 1862. In the Seven Days' Battles (qv) he commanded the Confederate left. In October 1862 he was appointed commander of the Department of Texas He recaptured Galveston 1 Jan 1863, and broke the blockade of that port. After the war he served as majorgeneral in the army of Maximulian in Mexico until the end of the empire, but finally in 1869 he settled at Houston for the rest of his life.

MAGRUDER, Julia, American novelist: b Charlottesville, Va, 14 Sept. 1854; d. Richmond, Va, 9 June 1907. Her literary career began in 1885 with 'Across the Chasm,' published anonymously. She wrote 'A Magnificent Plebeian'; 'The Violet'; 'Miss Ayr of Virginia'; 'A Manifest Destiny'; 'Princess Soma' (1895), etc.

MAGUAGA, Battle of. See Detroit, Siege AND CAPTURE OF.

MAGUINDANAO, mä-gēn-da'now, a tribe of Moros who inhabit the valley of the Rio Palangui, island of Mindanao; the Moros of the Sarangani Islands, and some of those of Davao Bay belong also to this group. See Philippine Islands

MAGYAR MUSIC. See Hungary, Music. MAGYARS, mö'györz, the original name of the Hungarians, which they still use in preference to any other. See Hungary.

MAHA-KAŚYAPA, mā hā' kāsh'yā pā, Kassappa, one of Buddha's first converts and one of his 80 great disciples who was favored by Buddha as his successor. After the death of Buddha he seems to have taken an active part in the work of organizing and propagating the faith. It was at his instance that the first Buddhist council of a general nature assembled. He gave considerable attention, according to tradition, to the organization and arrangement of the canonical books of the Buddhist faith. Playing such a prominent part at the dawn of the Buddhist religion, and being the beloved and trusted disciple of the master and, in a sense, his successor, it is natural that he should enter largely into the legendary and traditional religious lore of the Buddhists, as he does, in fact. Consult Bournouf, 'Indroduction à l'histoire du buddhisme indien' (Paris 1844); 'Le lotus de la bonne loi' (Paris 1852); Kern, 'Manual of Hindu Buddhism' (Strassburg 1896); Rhys, Davids, 'Buddhism' (London 1890);

MAHÂBHÂRATA. The name of this, the great national epic of the Hindûs, etymologically considered, consists of the word "mahâ," meaning "great," "mighty," and "bhârata," one of the several names of a powerful Indian tribe, but has reference more to the story itself, about "the great tale of the Bhâratas" In the shape in which the Mahâbhârata has come down to us it is enoimous in bulk, comprising some 100,000 çloka (couplets), and as its author is cited one Vyâsa. But the word "vyâsa" stands for "reviser," "collector," "editor," and this alone, irrespective of the fact that no description, no biographical detail of this Vyâsa has existed, seems clearly to prove that the Mahâbhârata represents a gradual growth and gathering of poetic material finally given a collective name and figuring as an entity. In the poem itself the number of çlokas (distichs) is given at 24,000, while there is



1 and 2 Magpie 3 Yellow-billed magpie

(Nearly one third natural size)

rather strong literary proof that the original core was even much smaller than that, namely, counting but 7,000 clokas. The total of the colossal remainder represents accretions and superimpositions that were at last included in the whole - many episodes, much legendary lore, lengthy and detailed ethical precepts, such as those addressed to the Kshatrias, the warrior caste, to guide their behavior to the other castes, and other material. Already in the 4th century AD the 'Mahabharata' was popularly held in the light of a code of laws as well; it was not alone the 'Iliad' and 'Odyssey' of the Hindû people combined, which youth studied and recited and learned by heart, but also a compendium of morals read aloud by the priests in the temples and shrines, at least fragments and selections from it. Thus we do know that the 'Mahabharata' is a work of great antiquity; but the exact period of its birth, the whole story of its genesis, we cannot even guess certain, however, that the kernel of the epic, describing the war between the Kurûs (or Bhâratas) and the Pândavas, must have antedated the time of Kalidâsa by many centuries The archaic language shows that. This simple tale gives us as heroes Duryôdhana, son of blind King Dhirtarâshtra, Drôna, Kama, Çalya among the Kurûs, and among the Pândavas the five sons of Pându, Ardjuna, Judishthîra, Bhîma, and the Vishnuic incarnation, their wise counselor, Krishna, the ruler of Yadava, the "spinner of all ruses and deceptions" The circumstance that the five Pandava brothers have jointly but one wife, Draupadi, and the fact that the caste, marriage and inheritance customs, as exemplified in the poem, are in strong contrast with later practices, of itself bespeaks great antiquity of this, the core of the epic Brahmanism had not yet crystallized when it originated At very different periods extraneous matter has been interpolated and amalgamated with this primary portion of the Mahabharata In fact, all that ran riot in the earlier Hindû mind in the shape of folklore, legend and myth was, one after the other, added to the first text and gradually coalesced with it. Hence, too, the enormous size of this lay as we have it now. But even as it is, the Mahabharata is by no means a unit accepted by all We see it subdivided in the north of India into 18 books (Parvans), sometimes including the 19th, the Harivamça; in the south it exists in 24 books, and the various chapters differ materially in sundry versions, both in text and size The most comprehensive and enlightening critical work in this line has been done by the Danish philologist, Sore Sorensen, in his compendium on Hindû literature (Copenhagen 1843). A careful examination of the whole text unavoidably betrays the mixed origin of the Mahabharata, shows plainly the earmarks of having been worked over, revamped, added to, and that numberless scribes have probably been busy at this task for a period exceeding 10 or 12 centuries. The composite character of the poem is also shown by the different metres, contents and spirit. By some scholars, such as Hopkins and Dahlmann, the conclusion has been reached that there were earlier portions of the epic than now remain; perhaps, as Grierson holds, describing an initial struggle for the possession of northern India between the Aryan settlers and their foes. As it stands at present the poem - meaning its

oldest core - 1s somewhat puerile, since it starts with an account of a gambling match, at which the Kurûs cheated the Pandûs, robbed them of the kingdom, and exiled them for 12 years While spending this exile in the forests and groves, tales are told to while away the dreary hours. When the exile draws to a close the Kurûs are utterly routed during an 18 days' battle This story furnishes the backbone; it is crude and in a literary sense sadly deficient, but it doubtless derives from the hoary past. The 20,000 stanzas of rules and instructions to the warrior caste are jumbled, often contradictory. From an artistic point of view the best parts of the whole are episodes like that of Damayânti and Nâla, of Savîtrı, etc, which have been successfully dramatized Like all of been successfully dramatized Like all of Hindû literature, even the best, there is a palpable lack of proportion But there are eminently strong passages, scattered here and there in the whole and showing pathos, tenderness, descriptive powers The student may be referred to a good summary of the poem, 'Mahâbhârata, the Epic of Ancient India,' condensed into English verse by Romesh Dutt (London 1898), to 'Geschichte der indischen to 'Das Mahâbhârata' (Kiel 1892-95), by Adolf Holtzmann; or to the English translation of the original work by a Hindû scholar, Protap Chandra Roy (Calcutta 1883).
Wolf von Schierbrand.

MAHADEVA, ma-hà-dā'va, in Hindû mythology, a deity who shares the attributes of Siva in the Indian Trinity, Mahadeva being regarded as a generator as well as a destroyer.

MAHAFFY, ma-hāf'i, John Pentland, Irish Greek scholar. b Chapponaire, near Vevay, Lake Geneva, Switzerland, 12 July 1839; d Dublin, Ireland, 1 May 1919. He was educated in Germany and at Trinity College, Dublin, from which he was graduated in 1850 and became professor of ancient his 1859, and became professor of ancient history in the college in 1871. In 1873 he was Donnellan lecturer His first publication was a translation of Kuno Fischer's 'Commentary on Kant' (1866); and on philosophical subjects he afterward issued several volumes. The greater number of his works, however, treat of the history, literature and everyday life of ancient Greece, among these being the following: 'Prolegomena to Ancient History' (1871); 'Greek Social Life from Homer to Menander' (1874); 'Greek Antiquities' (1876), a work much used in Continental schools; 'Rambles and Studies in Greece,' a record of antiquarian research (1876); 'Old Greek Education' (1876); research (1879); 'History of Classical Greek Literature' (1880; 3d ed, 1891); 'Greek Life and Thought from Alexander to the Roman Conquest' (1887), a continuation of the work of 1874; 'The Greek World under Roman Sway' (1890), 'The Greek World under Roman Sway' (1890), a continuation of the preceding; 'The Story of Alexander's Empire' (1890); 'Greek Pictures' (1890); and 'Problems in Greek History' (1892); 'The Progress of Hellenism in Alexander's Empire' (1905); 'The Silver Age of the Greek World' (1906); 'What have the Greeks done for Modern Civilization?' (1909). He wrote with special interest and authority of the post-Alexandrian period; and discovered interesting parallels beriod; and discovered interesting parallels between that and modern civilization. Among

his other writings are 'Twelve Lectures on Primitive Civilization' (1868); 'Report on the Irish Grammar Schools' (1880-81); 'The Decay of Modern Preaching' (1882), and 'The Art of Conversation' (1889); 'An Epoch in Irish History' (1904).

MAHALEB, a kind of European cherry (Cerasus mahaleb), whose fruit affords a violet dye and a fermented liquor. Its flowers and leaves are used by perfumers, and its wood by cabinet-makers See Cherry.

MAHAN, ma-hăn', Alfred Thayer, American naval officer b West Point, N Y, 27 Sept. 1840; d 1 Dec 1914 He was graduated from the United States Naval Academy in 1859, and served during the Civil War, rising to the rank of lieutenant-commander in 1865 In 1885 he was promoted captain, and in 1886 was appointed president of the Naval War College at Newport, a position which he held till 1888, and again 1892–93. In 1893–95 he was commander of the Chicago, and in 1896 was retired after 41 years' active service at his own request. In 1898 during the war with Spain he was a member of the Naval Board of Strategy; and in 1899 one of the United States delegates to The Hague Peace Conference In 1906 he was advanced to the rank of rear-admiral on the retired list. In 1890 he published his chief work, 'Influence of Sea Power upon History', the continuation, 'Influence of Sea Power upon the French Revolution and Empire,' appeared in 1892, this there will be a second to the second time to the second time. French Revolution and Empire, appeared in 1892; his other writings include 'The Gulf and Inland Waters' (1883); 'Life of Admiral Farragut' (1892); 'Life of Nelson' (1897), highly commended by English critics; 'The Interest of America in Sea Power' (1897), a compilaof America in Sea Power' (1897), a compila-tion of his magazine articles; 'Lessons of the War with Spain' (1899); 'The Problem of Asia' (1900); 'The South African War' (1900); 'Types of Naval Officers' (1901), 'Retrospect and Prospect' (1902); 'Seapower' in its Relations to the War of 1812 (1905); 'Some Neglected Aspects of War' (1907); 'From Sail to Steam' (1907); 'Naval Administration and Warfare' (1908); 'The Harvest Within (1909); 'The Interest of America in International Conditions' (1910); 'Armaments and Arbitration' (1912); 'Major Operations of the Navies in the War of American Independence (1913).

As a historian he made a distinct contribution to historical science as the first writer to demonstrate the determining force which maritime strength has exercised upon the fortunes of individual nations, and consequently upon the course of general history Technically, his representative work, the 'Influence of Sea Power upon History,' is but a naval history of Europe from the restoration of the Stuarts to the end of the American Revolution But the freedom with which it digresses on general questions of naval policy and strategy, the attention it pays to the relation of cause and effect between maritime events and international politics, and the author's literary method of treatment, place this work outside the class of strictly professional writings and make it a recognized leading authority. His prime object, in establishing the thesis that maritime strength is a determining factor in the prosperity of nations, was to reinforce his argument that the future interests of the United

States require a departure from the traditional American policy of neglect of naval-military affairs Captain Mahan was president of the American Historical Association in 1902–03; and received honorary degrees from several universities, including DCL from Oxford and LLD from Cambridge (England), Harvard, Yale, Columbia and McGill universities

MAHAN, Asa, American Congregational clergyman and educator. b Vernon, N. Y, 9 Nov. 1800; d Eastbourne, Sussex, England, 4 April 1889 He was educated at Hamilton College, Clinton, N. Y, and Andover Theological Seminary, and after holding pastorates at Pittsford, N. Y, and Cincinnati, Ohio, was president of Oberlin College 1838–50; and also professor of philosophy there He was president of Cleveland University 1850–56; and of Adrian College, Michigan, 1860–71 After the last-named date he lived mainly in England. Among his works were 'Doctrine of Christian Perfection' (1839), 'System of Intellectual Philosophy' (1845); 'The Will' (1846); 'Science of Logic' (1857); 'Mental Philosophy' (1882); 'History of Philosophy' (1883).

MAHAN, Dennis Hart, American military engineer. b New York City, 2 April 1802, d. near Stony Point, N. Y, 16 Sept. 1871 He was graduated at West Point in 1824, where in 1825 he was appointed assistant professor of mathematics and of engineering. He was stationed in Europe four years on professional duty and in 1832 returned to West Point as professor of military engineering, where he remained until his suicide, which was caused by temporary insanity. His textbooks are generally recognized authorities and include 'Treatise on Field Fortifications' (1836); 'Descriptive Geometry' (1864); 'Military Engineering' (1865); 'Permanent Fortifications' (1867); 'An Elementary Course of Civil Engineering' (1837, rewritten 1868), etc. Consult Abbot, H. L., 'in Biographical Memoirs of the National Academy of Sciences' (Vol. II, Washington 1886).

MAHAN, Milo, American Protestant Episcopal clergyman, biother of Dennis Hart Mahan (qv). b. Suffolk, Va., 24 May 1819; d Baltimore, Md, 3 Sept. 1870. He was educated at Saint Paul's College, Flushing, L. I, and in 1845 was ordained in the Protestant Episcopal Church. He was called to the charge of Grace Church, Jersey City, N. J., in 1848, and became assistant at Saint Mark's, Philadelphia, in 1850 In 1857-64 he was professor of ecclesiastical history at the General Theological Seminary, New York He became rector at Saint Paul's, Baltimore, Md, in 1864 and spent the remainder of his life there. Author of 'The Exercise of Faith' (1851); 'History of the Church During the First Three Centuries' (1860; enlarged to cover seven centuries, 1872); 'Palmoni, a Free Inquiry' (1864); 'The Comedy of Canonization' (1868); 'Collected Works' (3 vols, 1872-75).

MAHANADI, mä-ha-nud'i, or MAHA-NUDDY ("The Great River"), a river in British India. In the upper part of its course it drains the fertile plain of Chhattisgarh in the Central Provinces; flows southeast and then east through the province of Orissa, past Sambalpur and Cuttack, into the Bay of Bengal by two mouths, after a course of about 530 miles During the rains it is navigable 30 miles from its estuary, but a large portion of its channel is dry during five or six months of the year, and since the opening of the Bengal and Nagpur Railroad it has been little used for navigation It is estimated that the Mahanadi drains an area of nearly 44,000 square miles, and during the rainy season about 1,500,000 cubic feet of water passes every second through the Maraj gorge, which amount decreases in dry weather to 1,125 cubic feet. An extensive system of irrigation canals is connected with it. Diamonds are found in this river and in several of its tributaries.

MAHANOY (ma-ha-noi') CITY, Pa, a borough in Schuylkill County; alt. 1,230 feet; 18m. SW. of Hazleton; on the Lehigh Valley, and the Reading railroads. It is situated in the anthracite coal mining region of the Mahanoy Valley; mining was begun here in the early 1860's. The borough's principal industrial products are shirts, hosiery, and other apparel, cigars, and beer. First settlement, by Emanuel Boyer, tavernkeeper, was in 1853; incorporation as a borough, 1863. The name is a Delaware Indian word meaning deer lick; it was originally applied to the creek. Government is by burgess and council. Pop. (1930) 14,784; (1940) 13,442.

MAHARAJAH, ma-hä-rä'ja, a title used in India; applied in courtesy to every rajah, or to any person of high rank or deemed holy

MAHASEER, mä'ha-sēr, a large and ravenous barbel (Barbustor) of India, which reaches six feet in length and in the early part of the rainy season afford the best sport known to the anglers of India and Ceylon, as they take a fly readily, and struggle with the gameness and energy of a salmon to get free, pleasantly taxing the skill of the angler to bring them to land without breaking rod and line. They spawn at the heads of the hill-rivers, and then descend before the young are hatched. The fry then have an opportunity to grow in comparative safety to a size which enables them, the following season, to descend the rivers and take care of themselves; otherwise they would be devoured in infancy by their elders.

MAHATMA, a Hindu word meaning "the great-souled one," and applied among the Brahmans to one who has attained the highest possible point of spiritual enlightenment. It is also the name of a high priest or "wise leader" of the theosophists

MAHĀYĀNA ("The Great Vehicle"), the name of one of the principal divisions of Buddhism (q.v.). It originated in northern India about the beginning of the Christian era through a gradual synthesis of tendencies already manifest in earlier Buddhism, possibly with some admixture of ideas from the West.

In its philosophy the Mahāyāna goes beyond primitive Buddhism's denial of the real existence of a soul or ego, and maintains the doctrine of the utter unreality of all experience. This is expressed in the formula "everything is void," which is interpreted by the Madhyamaka, or sceptical, school as meaning that it is impossible either to affirm or to deny anything concerning reality, whereas the Vijnānavādins, or idealists, declare "the void" to be pure thought, without distinction of subject or object. Both

schools admit that the illusion of the phenomenal world is invincible for even the wisest man, and that only the Buddhas are perfectly free from it, so that the practical validity of experience is not impaired

The idea of the Buddha, or "Enlightened One," has received a great extension in the Mahāyāna, and the human traits of the historic Gautama have been lost in the radiance of divinity. There are countless Buddhas throughout the worlds, and they manifest themselves through infinite periods of time in the various heavens, as well as by appearing on earth in the guise of human teachers. In their function of enlightening all creatures they are aided by the celestial Bodhisattvas, or Buddhas-to-be, who are more actively beneficent Among the are more actively beneficent Among the Buddhas the most worshiped is Amitābha, "He of Boundless Light," the ruler of the Western Paradise called Sukhavati, "Happy Land" This who is quite unknown in the earlier Buddhism, is presumably of solar origin The merciful Avalokiteśvara and Manjuśri, the fount of wisdom, are especially prominent Bodhisattvas. The belief in female Bodhisattvas, such as Tārā and the Chinese Kwan-yin, is vas, such as lara and the Chinese Rwan-yin, is a later development, as is also the notion of a "primordial Buddha," or First Cause. All this luxuriant polytheism is harmonized with the doctrine of "the void" through the belief that a Buddha has three "bodies" or modes of being, the "body of the Law," identical with the void, the "body of bliss," an appearance manifested to the celestial beings and the "body of fabrito the celestial beings, and the "body of fabrication," the illusory form of an earthly Buddha such as Gautama

The Mahāyānist belief in the powerful and merciful Buddhas and Bodhisattvas is accompanied by a new conception of the religious life. Instead of the older self-centred system of monastic discipline, by which the individual was to obtain final deliverance, Nirvana, at the close of his present existence, the Mahāyānists made it their goal to become Buddhas themselves, after practising all the virtues through numberless existences, for the sake of the salvation of all beings Everyone who consecrates himself to this aspiration is a Bodhisattva, or potential Buddha, although he will not attain the rank of a celestial Bodhisattva until toward the last of the 10 stages in his career. Self-sacrifice, rather than self-restraint, is therefore the keynote of the ethics of the Mahāyāna, and though the institution of monasticism is preserved, the discipline is relaxed, and laymen also may follow the career of a Bodhisattva. Prayer and confession of sins to the Buddhas are commanded and forgiveness is believed to be secured through their superabundant merits.

The broadly human quality of the Mahāyāna religion involved a certain sacrifice of the distinctive features of Buddhism, and its later development, particularly in the form of the Tantra (q.v) system, shows a gradual approximation to the contemporary Hinduism. Hence in India the Mahāyāna ultimately gave way to the Vedānta philosophy and the popular religions of Vishnu and Siva; but it still survives in the countries to the north and east, whither it had been carried by missionary activity. In Tibet and Mongolia it has assumed the form of Lamaism (q.v.), while in China and Japan it shows more of its primitive character, although

in the latter country especially it has split into numerous sects, some of which hold a decidedly

theistic belief

Bibliography.— The sacred books of the Mahāyāna are very numerous and are still imperfectly known Among those accessible in translations are 'The Lotus of the True Law' (trans. by H Kern in 'Sacred Books to the East,' Vol XXI, 1884); various shorter texts in the same series (Vol XLIX, part 2, 1894); Sāntideva's 'The Path of Light' (trans. by L D. Barnett, 1909); 'The Awakening of Faith,' sometimes ascribed to Aśvaghosha (trans by T. Suzuki, 1900) Consult also Suzuki, D. T., 'Outlines of Mahāyāna Buddism' (1907); Stcherbatsky, 'The Conception of Buddhist Nirvana' (1927).

CHARLES J. OGDEN.

MAHDI, mä'dē. See MAD MULLAH

MAHÉ, ma-há', Indian Ocean, the largest island of the Seychelles Archipelago, belonging to Great Britain It is 17 miles long by 4 miles broad, has an area of 55½ square miles and attains an elevation of 2,000 feet above sea-level, from which it rises in most places nearly perpendicularly. It contains Victoria, the administrative seat, and a coaling station with a good harbor. Pop. 20,000. For description of surrounding islands, see Seychelles.

MAHI KANTHA (ma'hē kān'tha) AGENCY, India, a group of native Gujerat states, administered since 1820 by a British political agent of the province of Bombay The chief state, Idar, occupies about one-half of the combined area of 3,125 square miles There are 11 other states of much importance The climate is fair, April and May being the hottest months, and January the coolest. The average annual rainfall at Idar is 34 inches About one-fourth of the area is capable of cultivation. During the famine of 1899–1900 a great number of the people perished. Pop. about 450,000, consisting largely of wild Bhil and Khoil tribesmen.

MAHICAN, mā-hīk'an (meaning "wolf"), an Algonquin tribe of American Indians formerly occupying the Hudson River Valley They were closely related to the Delawares and the Mohegans, the collective tribes being known as the Loup or Wolf Indians At one time there was a settlement of 40 villages near the site of the present city of Albany. The assaults of the Iroquois and the white settlers diminished the tribe until the remnants of the race became merged with the Delawares. In 1736 those who still remained in Massachusetts, whither they had removed some years before, came together as a unit at Stockbridge and assumed the name of Stockbridge Indians. Later they removed to New York, but now, together with a part of the Munsee, they are located upon a reservation near Green Bay, Wis.

MAHMUD (mā-mood') I, or MOHAM-MED, Turkish sultan: b. Constantinople 1696; d. 1754. He was the son of Mustapha II and succeeded his uncle Achmet III in 1730. He was a well-disposed but incapable monarch and his reign is of little importance. See MOHAM-MED.

MAHMUD II, Turkish sultan: b 20 July 1785; d. 1 July 1839. He was the second

son of Abd-ul Hamid I, and under the reign of his uncle Selim III he received an education exceptionally broad for a prince of his station. He succeeded his brother Mustapha in 1808 and organized his government on a reform basis. He conducted a war against Russia and Serbia until 1812, when by the Treaty of Bucharest Moldavia and a greater part of Wallachia were restored to the Ottoman government, even though the Russian frontier was somewhat advanced. He subjected the Wahabees and quelled the insurrection of Ali Pasha of Jannina in 1822 In his war with the Greeks he incurred the intervention of the powers with disastrous results to his forces and by the Treaty of Adrianople (qv) he was obliged to yield so much that his power was greatly weakened Mahmud was a progressive monarch, he introduced modern ideas of warfare, a regular police system and founded schools. Against serious obstacles he crushed the jamssaries, but a second rebellion of Mehemet Ali in 1839 was followed by a defeat which shortly preceded the broad-minded monarch's death.

MAHMUD, sultan of Ghazni, the founder of the Mohammedan emptre in India b Ghazni, about 970; d. 29 April 1030. His father, Sabuktagın, governor of Ghazni, owed a nominal allegrance to Persia, but was really independent. On his death Mahmud put aside his brother Ismail, whom his father had appointed to succeed him, took the title of sultan, then overthrew the Persian monarchy, and laid the foundation of an extensive empire in central Asia. He then turned his attention to India, which he invaded repeatedly His earlier expeditions into the country were directed against successive rajahs of Lahore, on whom he inflicted repeated defeats. In 1008 the Rajah of Lahore, Anangpal, with the assistance of a powerful coalition of rajahs, had assembled one of the largest armies yet seen in the Punjab, but Mahmud was again victorious and carried away enormous spoils from the temple of Nagarcot. On his return he celebrated a triumph at Ghazni In 1010, after subduing Ghur in the Hindu-Kush, he resumed his conquests in India, captured Multan, plundered the temple of Tanesar and continued for a number of years to extend his conquests in successive expeditions. These for a time were interrupted by his conquest of Transoxiana, effected in 1016. In 1017 he set out at the head of an army of 100,000 foot and 20,000 horse, passed the Jamna Jummd and turning to the south appeared before Canoi, the largest and most magnificent Indian city of the day, the rajah of which took precedence of all the Indian rajahs. As the Rajah of Canoj at once submitted it was spared from pillage, a fate to which Mattra, a famous religious city, was subjected without restraint for 20 days In 1023 he annexed the territories of Jeipal II who had revolted and established for the first time a permanent Mohammedan garrison in Lahore His last, which is usually called his 12th, expedition into India (1024-26) was directed against Gujerat. He took the capital and changed the government, but the chief attraction was Somnáth. The magnificance of the capital statement of the capital cence of its temple filled him with wonder and the descriptions of it suggest images of the palace of Aladdin. Its lofty roof was supported by 56 pillars carved and glittering with

precious stones. It was lighted by a lamp suspended from the centre by a gold chain. A huge idol, which Mahmud broke, was found hollow and disclosed immense treasures in diamonds and precious stones. The pieces of the idol were sent to Mecca, Medina and Ghazni. The remainder of his enterprises were confined to western Asia. Mahmud was avaricious and loved to accumulate treasures from his warlike expeditions. Consult Elliot, 'History of India'; Lane-Poole, 'Mediæval India under Mohammedan Rule' (London 1903).

MAHMUD, Shevket Pasha, Turkish soldier and statesman: b Bagdad 1857; d. 11 June 1913. At 24 he came under the influence of the German general von der Goltz, then reorganizing the Turkish army and by whom he was sent to purchase war material in Germany and France After 10 years' sojourn in western Europe, Mahmud Shevket returned home with advanced ideas. As governor of the vilayet of Kossovo he threw in his lot with the Young Turk revolution in 1909 The new ministry placed him in command of an army corps at Salonica He suppressed the counter-revolution in Constantinople and in 1910 became Minister of War until 1912. In January 1913 he was appointed Grand Vizier and War Minister combined, in which capacity he concluded peace with the Balkan League (q v). He was murdered while motoring to the Porte.

MAHO, or MAHAGUA. The West Indian names of an important fibre plant, Hibiscus tiliaceus or linden hibiscus, lemon hibiscus or corkwood, a member of the mallow family. It is a handsome woody shrub or small tree with large lemon-yellow flowers and entire broadly cordate leaves like linden. Low banks of tidal rivers is its favorite habitat and it is widely distributed over tropical America, Polynesia and the shores of the Indian Ocean. In some of the Pacific islands it grows spontaneously in large areas which have been abandoned after previous cultivation. The bark contains a strong flexible fibre used for many purposes, especially by the aborigines who also used the wood for making fire in the primitive fashion. The dark green heart wood is very tough and durable. The plant has remarkable properties of renewing fertility of soil which has been exhausted by crops. The maho is considered indigenous to America and apparently on account of its useful character it was distributed widely over the islands and shores of the Pacific and Indian oceans before the arrival of Europeans. The etymology of its names in various regions gives some important clues as to the history of its distribution.

MAHOGANY. A popular name for the timber of several unrelated trees, among which are various species of eucalyptus (qv.), natives of Australia and members of the family Myrtaceæ; two species of Cercocarpus, of the family Rosaceæ, C. montanus being known as valley mahogany and C ledifolius as mountain mahogan; in the Rocky Mountain region where they are native and are mainly used for fuel. African mahogany (Khya senegalensis), East Indian mahogany (Soymda febrifuga), and Cedrela toona, an East Indian tree equally well known also as the toona, all belong to the family Meliaceæ, but are less important timber trees than the true mahogany (Swietenia

mahagoni) of the same family. This species is a native of tropical America, occasional small specimens being found in extreme southern Florida It was formerly abundant in the West Indies, attaining heights of 150 feet or more in Jamaica, but on account of the demand it is now scarce. Cuba and Santo Domingo formerly supplied the choicest; Honduras the low grades; now practically all comes from Central America The wood is generally some shade of brown, fine grained, easily polished and durable except under lateral strain. It is highly valued for furniture, musical instruments, interior house-finishing, etc., and is one of the most popular woods of the world. Formerly it was used for ship-building but now very little The tree, which sometimes attains heights exceeding 100 feet, and diameters of six feet, has abruptly pinnate leaves with usually four pairs of leaflets, and small white or yellowish flowers in axillary or nearly terminal panicles As an ornamental tree it is planted in southern Florida and southern California in rich soil. A few other related species of this genus are occasionally found in commerce.

MAHOMET. See MOHAMMED.

MAHOMMEDAN LAW. See MOHAM-MEDANISM.

MAHON, ma-hōn', or PORT MAHON (ancient Portus Magonis), Spain, city and port, on the island of Minorca, of which it is the capital, at the head of a bay which forms one of the best harbors on the Mediterranean. Fishing, fish-curing, agriculture and stock raising are the chief occupations. In the bay are several rocky islets, on one of which stands an arsenal, on a second a lazaretto and on a third a naval hospital. There are also a fine church, the consistorial palace, a theatre, museum and library. The harbor is strongly fortified. The exports are brandy, wine, dried fruits, agricultural produce, etc; and the imports, grain, wearing apparel, tobacco, sugar, coffee, cacao, leather, hats and other manufactured goods. Its trade amounts to about \$1,000,000 annually. Mahon is believed to have been founded by the Carthaginian general Mago, whence its ancient name. It was occupied by the English in 1708. It was taken from them, after a memorable siege, by the French under Marshal Richelieu on 28 June 1756. Admiral Byng was shot for failing to relieve it. It was restored to the English in 1763; and taken by the Spaniards in 1782. It was retaken in 1798, and finally given to Spain by the Treaty of Amiens in 1802. Pop. 17,542

MAHONE, ma-hōn', William, American soldier and politician b. in Southampton County, Va., 1 Dec 1826; d Washington, D C., 8 Oct. 1895 He was graduated at the Virginia Military Institute in 1847, and became a civil engineer and railroad constructor. At the opening of the Civil War he entered the Confederate army; took part in the Peninsular and Rappahannock campaigns, and by bravery at Petersburg acquired the sobriquet "The Hero of the Crater." (See Petersburg, Military Operations Against). In 1864 he was made brigadier-general and major-general. The war over, he accepted the presidency of the Norfolk and Tennessee Railroad, and also became active in politics. He was the principal organizer (about

1878) and leader of the Readjusters (q.v.), chiefly a faction of the Democratic party in Virginia who favored the forcible readjustment of the State debt on terms involving conditional or partial repudiation Mainly by the supporters of this movement, he was elected in 1880 to the United States Senate, where, however, he acted with the Republicans, making the vote of the Senate a tie and disappointing the Democrats of their expected majority. By this and other acts of his senatorial career he lost favor with his constituents and was not re-elected

MAHONY, mah'ō-nĭ, Francis Sylvester, "Father Prout," Irish author: b. Cork 1804; d Paris, 1866. Educated at a Jesuit seminary at Amiens, he studied theology at Paris, was admitted into the Order of the Jesuits and taught for some time in a Jesuit college in Ireland, but for some irregularities was deprived of the position of a member of the order. He received clerical ordination and officiated for a short time at Cork and in London, but soon adopted the profession of literature. In 1834–36 he contributed the 'Prout Papers' to Fraser's Magazine, published as the 'Reliques of Father Prout' in 1836. In 1846 he became Rome correspondent to the London Daily News, his letters being afterward republished as 'Facts and Figures from Italy' (1847). In his later years he was Paris correspondent for the Globe. The 'Reliques of Father Prout' in a revised and enlarged form were published in 1860, and 'Final Reliques' in 1876. In 1881 Charles Kent published a collective edition with a memoir. He will be longest remembered by his poem 'The Bells of Shandon.'

MAHRATTAS, ma-răt'az, a native Hindu race, supposed to be descendants of the Persians, and occupying a large tract of central and western India. They have always been a distinct nation or people, and still consider themselves as such, even though now largely under British or Mohammedan jurisdiction. They came into prominence about the middle of the 17th century, when the chief, Sevaji extended his conquests in various directions, had himself crowned king in 1674 and established the Mahratta Empire. After his death long minorities and the incompetency of the sovereigns caused the powers of the state to fall into the hands of the Peshwa or Prime Minister, who became the acknowledged head of a Mahratta confederacy. The first trouble with the British broke out in 1775 and was not settled until 1782. This happened during the admin tration of Warren Hastings (q.v.). The next outbreak came in 1803-05 and resulted not only in the acquisition of territory by the British but also in strengthening their power. Meanwhile the confederacy had held together till 1795, but internal wars and disturbances reduced the Peshwa to the position of a British dependent, and Scindia, Holkar and the Rajah of Berar were able to take the position of independent sovereigns. The confederacy came to a final end in 1818, after the third collision wherein the Peshwa himself took up arms against the British, and Scindia, Holkar, the Guicowar of Baroda, and the Rajah of Kolapore became dependent princes under British protection. The state of Gwalior came under British control in 1844. Though devout worshipers of Brahma. no distinction of caste exists among

them. Consult Grant-Duff, 'History of the Mahrattas' (Bombay 1863); Kincaid, C. A. and Parasnis, R, 'A History of the Maratha People' (Vol I, London 1919); Ranade, 'Rise of the Maratha Power' (ib. 1900); 'Imperial Gazetteer of India' (Oxford 1909).

MAI, Angelo, an'jā-lō ma'ē or mī, Cardī-NAL, Italian classical scholar. b. Schilpario, near Bergamo, Italy, 7 Maich 1782; d. Albano, 8 Scpt. 1854. His abilities attracted the notice of Father Mozzi, a Jesuit, who instructed him in Latin, Greek and mathematics. On the establishment of a Jesuit college at Colorno, in the duchy of Parma, he accompanied Father Mozzi thither in 1799, and a few years afterward was made professor of Latin and Greek in the Jesuit college at Naples (1804). He was transferred to Milan (1808), where he became an associate of the Ambrosian College, and one of the curators of the Ambrosian Library. One special department to which he devoted himself was the examination of the palimpsests (qv) and through his industry in deciphering these, two volumes of fragments of Cicero's orations, of Lysimachus and of Isæus, a fragment of the (Vidularia) (a lost comedy of Plautus), and a collection of the letters and other writings of Cornelius Fronto, the preceptor of Marcus Aurelius, were recovered and given to the world. In 1819 he was appointed chief keeper of the Vatican Library at Rome, and discovered beneath a manuscript of Saint Augustine's 'Enar-rationes in Psalmos' obliterated fragments of Cicero's treatise 'De Republica,' amounting to about a fourth of the original, which he published in 1822 with a critical commentary A colossal work was then undertaken by Mai, the editing of the various unpublished manuscripts in the Vatican, sacred and profane. It comprises 10 quarto volumes, under the title of Scriptorum Veterum Nova Collectio e Vaticanis Codicibus Edita' (1828–38), and consists of numerous fragments, previously believed to be lost, of the ancient historians, such as Polybius, Diodorus Siculus, Dionysius of Halicarnassus, Dion Cassius, Appian and others, besides the various writings of the Fathers In 1838 he was created a cardinal A new collection, 'Spicilegium Romanum,' was published in 10 volumes between 1839 and 1844, and a patristic series, called 'Nova Patium Bibliotheca,' issued between 1845 and 1853, closed his list of publications. Consult his life by G. Poletto (Siena 1887); also Prina, B, 'Biografia del cardinale Argela Mei (P. B. 1992). dinale Angelo Mai³ (Bergamo 1882); Sandys, J. E., 'A History of Classical Scholarship³ (Vols. I, III, Cambridge 1908).

MAIA, mā'ya, in Greek mythology, the eldest daughter of Atlas and Pleione. She was placed with her six sisters among the stars, where they have the common name of *Pleiades*. The Romans also worshiped a Maia, who was also called *Majesta*, and was afterward identified with the daughter of Atlas. The Tusculans called their principal deity *Majus*. The month of May is said to have received its name from them.

MAID OF ATHENS, immortalized by Lord Byron, was Theresa Macri, who 25 years after Byron's poem was written had lost her beauty, lived in a hovel in dire poverty and had reared a large family.

MAID MARIAN, a name given Matilda, daughter of Fitz-Walter, baron of Bayard and Dummow. She eloped with Robert Fitz-Ooth, an outlaw, and lived with him in Sherwood Forest. It is supposed that she was married by Friar Tuck to Fitz-Ooth, who was more commonly called Robin Hood (qv).

MAID OF THE MIST, (1) the name of a small steamboat used on the Niagara River below the Falls, to carry passengers close to the cataract. (2) A name given to the heroine of Sir Walter Scott's 'Anne of Geierstein'

MAID OF ORLEANS, a name given Jeanne d'Arc (1412-31). See Joan of Arc.

MAIDEN, or THE WIDOW, an instrument of capital punishment used in Scotland during the 16th century, the prototype of the French guillotine (q.v) It consisted of an upright frame and a broad piece of iron a foot or It consisted of an upmore wide, sharp on the lower part and loaded above with lead. At the time of execution this was pulled up to the top of the frame, in which was a groove on each side for it to slide in The prisoner's neck being fastened to a bar underneath, on a sign given the cutting iron was let loose, and the head instantly severed from the body. Its first victim is said to have been Thomas Scott, executed 3 April 1565, one of the agents in the assassination of Rizzio. In 1581 it was used in the execution of the Earl of Morton, the alleged inventor.

MAIDEN QUEEN, in England, a popular title bestowed upon Queen Elizabeth.

MAIDENHAIR FERN. See FERNS AND FERN ALLIES

MAIDENHEAD, England, market town and municipal borough in Berkshire, on the Thames, 24 miles west of London, on the Great Western Railway. It is an ancient town and was formerly known as Maydenhutt, or Maydenhuth, and while its stone bridge which takes the London road over the Thames dates only from 1772 there are records of earlier bridges as early as 1297. It was incorporated as a guild to maintain the bridge by Henry VI, in 1451 It had formerly a large carrying trade in malt, meal and timber but it is now principally a residential town and pleasure resort for boating parties. The Wednesday market is still held under the charter of Queen Elizabeth, dating from 1582. Pop. about 17,000.

MAIDSTONE (Saxon Medwegestun) England, municipal and Parliamentary borough and the county town of Kent, 34 miles eastsoutheast from London, on the banks of the The town consists chiefly of four principal streets, which cross each other at the market-place, with smaller ones branching off at right angles. Its fine old Collegiate Church of All Saints is supposed to be of the 14th century, and is one of the largest parish churches in England. It has historical associations with the rebellions of Jack Cade and Sir Thomas Wyatt, and was stormed by the Parliamentarians under Favifase in 1648. It has excellent educational institutions; schools, libraries, science and art institutions, museums, play grounds and parks. The chief industries are paper-making (for which there are several large mills), brewing, iron founding and the manufacture of agricultural implements. It is the centre of a great hop district, the cultivation of hops having been carried on since the seventeenth century. Corn markets and cattle markets are still held every week From ancient Saxon times until 1830 malefactors were executed on Penenden Heath, now enclosed as a public recreation ground. Pop. 42,000.

MAIDU PEOPLE, an aboriginal Pujunan group of Indians of northern California, of which the chief tribe, the Concow, inhabited the region of the Upper Sacramento River. Their descendants are to be found in the Round Valley Reservation. Their communities comprised rough dwelling-places or hogáns built of boards, large circular halls or town-houses for assemblies and ceremonials and wicker store-houses for the winter supply of acorns which with piñons formed their staple food supplies. Their clothing was of the scantiest description; the chief of their numerous dances was the acorn dance; and they had a secret male society in which the initiatory age was 12 Consult Dixon, R B, 'Maidu' (in Boas, 'Handbook of American Indians,' Washington 1911); id., 'Maidu Texts' (in American Ethnological Society Publications, Vol IV, Leyden 1912).

MAIGNAN, Albert, al-bar ma-nyan, French painter b Beaumont, Sarthe, 14 Oct. 1845; d. Paris, 29 Sept 1908 He studied at Paris under Noel and developed a strong and original manner in historical and landscape painting. At the Salon of 1879 he was awarded a first class medal Amongst the most striking of his pictures are 'Dante's Meeting with the Countess Matilda' (1881) now in the Luxembourg; and 'Assault on Pope Boniface VIII at Anagni' in the New York Metropolitan Museum of Art.

MAIGRE, ma'ger, or MEAGRE, a large European drum-fish (Sciana aquila), common in the Mediterranean, where it forms one of the most important local food-fishes. It may attain a length of six feet, and its flesh has always been a favorite with epicures. Yarrell says that anciently on account of its large size it was always sold in pieces, and that the fishermen of Rome were accustomed to present the head, considered the finest part, as a sort of tribute to the three local magistrates who acted for the time as the conservators of the city.

MAIL-SHELL. See CHITON.

MAILDUN, mal'doon, MAELDUIN, or MAELDUNE, hero of Irish romance, 'Voyage of Maildun.' He was the son of Ailull Ocar Aga, of the tribe of Owenaght of Ninus, in County Clare, and before his birth his father was killed by pirates He grew up handsome and accomplished, but had scarce reached manhood before he set sail with a crew of 60 men to find his father's murderer. For three years and seven months he voyaged on the Western Ocean seeing marvels such as no eyes had seen before At length he found the murderer of his father, but pardoned him his wrong in gratitude to the great mercy of God who had delivered him from so many perils. Consult Joyce, P. W, 'Old Celtic Romances' (tr from Gaelic, 3d ed., New York 1898); Tennyson, 'The Voyage of Maeldune'

MAILLY, William, American Socialistic journalist: b Pittsburgh, Pa, 22 Nov. 1871; d. 4 Sept 1912. He was educated in the common schools of Scotland and England, and in 1895-

96 was editor of the Birmingham Labor Advocate. He returned to the United States and in 1898 organized the Social Democratic party of New York. He edited the Social Democrat at Haverhill, Mass, in 1899-1900; was associate editor of The Worker in New York in 1901 and in 1906-07; and managing editor of New York Evening Call in 1908-09. He was one of the organizers of Social Democrat, later Socialist, party at Chicago in 1898; organizer and secretary of the Socialist party of Massachusetts in 1902; and in 1905-06 he was a member of the National Executive Committee of the

Socialist party.

MAIMON, mī'mon, Salomon, German phimanimon, mi mon, Salomon, German philosopher: b. near Mir in Minsk, 1754; d Siegersdorf, Lower Silesia, 22 Nov. 1800. He was trained for a rabbi, but having become acquainted with the philosophy of Maimonides, he made his way to Berlin, and studied modern philosophy, languages and some science. Besides cultivating his own mind and teaching a sides cultivating his own mind, and teaching a Ittle, he wrote some philosophical treatises and literary hack-work. Yet he had Mendelssohn, the philosopher, among his friends, was admired by Kant and attracted the attention of Goethe. This he owed to his 'Attempt at a Philosophy of Transcendentalism' (1790), in which he set out to supplement Kant's system with truths gleaned for the most part from Spinoza, Leibnitz, Hume, Locke and others. Consult Witte, 'S. Maimon' (Berlin 1876)

MAIMONIDES, mī-mŏn'i-dēz, properly Moses Ben Maimon Ben Joseph (Arabic, Abu Amram Musa ibn Maimun Obeid Allah al Kortobi), Jewish scholar: b. Cordova, Spain, 30 March 1135; d. 13 Dec 1204. At an early period he developed a taste for the exact sciences and for philosophy. He read with zeal not only the works of the Mohammedan scholastics, but also those of the Greek philosophers in such dress as they had been made accessible by their Arabian translators. In this way his mind, which by nature ran in logical and systematic grooves, was strengthened in its bent; and he acquired that distaste for mysticism and vagueness so characteristic of his literary labors. He went so far as to abhor poetry, the best of which he declared to be false, since it was founded upon pure invention - and this too in a land which had produced such noble expressions of the Hebrew and Arab muse. It is strange that this man, whose character was that of a sage, and who was revered for his person as well as for his books, should have led such an unquiet life, and have written his works so full of erudition with the staff of the wanderer in his land. For his peaceful studies were rudely disturbed in his 13th year by the invasion of the Almohades, or Mohammedan Unitarians, from Africa. They not only captured Cordova, but set up a form of religious persecution which happily is not always characteristic of Islamic piety. Maimonides' father wandered to Almeria on the coast; and then (1159) straight into the lion's jaws at Fez in Africa,—a line of conduct hardly intelligible in one who had fled for the better exercise of the dictates of conscience. So pressing did the importunities of the Almohad fanatics become, that together with his family Maimonides was compelled to don the turban, and to live for several years the life of an Arabic Marrano. This blot upon his

fair fame — if blot it be — he tried to excuse in two treatises, which may be looked upon as his "Apologia pro vita sua": one on the subject of conversion in general (1160), and another addressed to his coreligionists in southern Arabia on the coming of the Messiah But the position was untenable and in 1165 we find Maimonides again on the road, reaching Accho, Jerusalem, Hebron and finally Egypt Under the milder rule of the Ayyubite caliphs, no suppression of his belief was necessary. Maimonides settled with his brother in old Carro or Fostat, gaining his daily pittance first as a jeweler, and then in the practice of medicine, the while he continued in the study of philosophy and the elaboration of the great works upon which his fame reposes. In 1177 he was recognized as the head of the Jewish community of Egypt, and soon afterward was placed upon the list of court physicians to Saladin. When he died, his body was taken to Tiberias for builal.

Perhaps no fairer presentation of the principles and practices of rabbinical Judaism can be cited than that contained in the three chief works of Maimonides. His clear-cut mind gathered the various threads which Jewish theology and life had spun since the closing of the Biblical canon, and wove them into such a fabric that a new period may fitly be said to have been ushered in The Mishnah had be-come the law-book of the Diaspora; in it was to be found the system of ordinances and practices which had been developed up to the 2d century AD. In the scholastic discussions in which the Jewish schoolmen had indulged their wit and their ingenuity, much of its plain meaning had become obscured. At 23 Maimonides commenced to work upon a commentary to this Mishnah, which took him seven years to complete. It was written in Arabic, and very fitly called 'The Illumination'; for here the philosophic training of its author was brought to bear upon the dry legal mass, and to give it life as well as light. The induction of philosophy into law is seen to even more peculiar advantage in his 'Mishnah Tōrah' (Repeated Law). The scholastic discussions upon the Mishnah had in the 6th century been put into writing, and had become that vast medley of thought, that kaleidoscope of schoolroom life, known by the name of Talmud. Based upon the slender framework of the Mishnah, the vast edifice had been built up with so little plan and symmetry that its various ramifications could only be followed with the greatest diffi-culty and with infinite exertion. In turn, the Talmud had supplanted the Mishnah as the rule of life and the directive of religious observance. Even before the time of Maimonides, scholars had tried their hand at putting order into this great chaos; but none of their efforts had proved satisfactory. For 10 years Mai-monides worked and produced this digest, in which he arranged in scientific order all the material which a Jewish jurist and theologian might be called upon to use. Though this digest was received with delight by the Jews of Spain, many were found who looked upon Maimonides' work as an attempt to crystalization unchangeable law the fluctuating streams of tradition. The same objection was made to his attempt to formulate into a great the attempt. his attempt to formulate into a creed the purely theological ideas of the Judaism of his day. His 'Thirteen Articles' brought on a war of strong opposition; and though in the end, the fame of their author conquered a place for them even in the Synagogue Ritual, they were never accepted by the entire Jewry. They remained the presentation of an individual scholar.

But his chief philosophical work, his 'Guide of the Perplexed' (Dalālat al Hāirin), carried him still further and for centuries fairly divided the Jewish camp into two parties The battle between the Maimonists and anti-Maimonists waged fiercely in Spain and Provence In the 'Guide of the Perplexed' Maimoni-

des has also produced a work which was "epoch-making in Jewish philosophy It is the best attempt ever made by a Jew to combine philosophy with theology. Aristotle was known to Maimonides through Al-Farābi and Ibn Sinā (Avicenna); and he is convinced that the Stagyrite is to be followed in certain things, as he is that the Bible must be followed in others. In fact, there can be no divergence between the two; for both have the same end in view,—to prove the existence of God. The aim of metaphysics is to perfect man intellectually; the same aim is at the core of Talmudic Judaism. Reason and revelation must speak the same language; and by a peculiar kind of subtle exegesis - which provoked much opposition, as it seemed to do violence to the plain wording—he is able to find his philosophical ideas in the text of the Bible But he is careful to limit his acquiescence in Aristotle's teachings to things which occur below the sphere of the moon. He was afraid of coming into contact with the foundations of religious belief, and of having to deny the existence of wonders. The Bible teaches that matter was created, and the arguments advanced in favor of both the Platonic and Aristotelian views he looks upon as insufficient. The Jewish belief that God brought into existence not only the form but also the matter of the world, Maimonides looks upon much as an article of faith. The same is true of the belief in resurrection. He adduces so little proof for this dogma that the people of his day were ready to charge him with heresy

Maimonides is able to present 25 ontological arguments for his belief in the existence, unity and incorporeality of God. What strikes one most is the almost colorless conception of the Deity at which he arrives. In his endeavor to remove the slightest shadow of corporeality in this conception, he is finally led to deny that any positive attributes can be posited of God. Such attributes would only be "accidentia"; and any such "accidentia" would limit the idea of oneness. Even attributes which would merely show the relation of the Divine Being to other beings are excluded; because he is so far removed from things non-Divine, as to make all comparison impossible. Even existence, when spoken of in regard to him, is not an attribute. In his school language, the "essential" of God involves his "existentia." We have therefore to rely entirely upon negative attributes in trying to get a clear concept of

the Deity. If the Deity is so far removed, how then is he to act upon the world? Maimonides supposes that this medium is to be found in the world of the spheres. Of these spheres there

are nine: "the all-encompassing sphere, that of the fixed stars, and those of the seven planets"
Each sphere is presided over by an intelligence
which is its motive power. These intelligences are called angels in the Bible. The highest intelligence is immaterial It is the noûs poretikôs, the ever-active intellect. It is the power which gives form to all things and makes that which was potential really existent "Prophecy is an emanation sent forth by the Divine Being through the medium of the active intellect, in the first instance to man's rational faculty and then to his imaginative faculty. The lower grade of prophecy comes by means of dreams, the higher through visions accorded the prophet in a waking condition. The symbolical actions of the prophets are nothing more than states of the soul " High above all the prophets Maimonides places Moses, to whom he attributes a special power, by means of which the active intellect worked upon him without the mediation of the imagination. The psychological parts of the 'Guide' present in a Jewish garb the Peripatetic philosophy as expounded by Alexander of Aphrodisia. Reason exists in the powers of the soul, but only potentially as latent reason (noûs húlikos). It has the power to assimilate immaterial forms which come from the active reason. It thus becomes acquired or developed reason (noûs epiktetos); and by still further assimilation it becomes gradually an entity separable from the body, so that at death it can live on unattached to the body. In ethics Maimonides is a strong partisan of the doctrine of the freedom of the will. No one moves him, no one drives him to certain actions. He can choose, according to his own inner vision, the way on which he wishes to walk. Nor does this doctrine involve any limitation of the Divine power, as this freedom is fully predetermined by the Deity. But Maimonides must have felt the difficulty of squaring the doctrine of the freedom of the will with that of the omniscience of God; for he entrenches himself behind the statement that the knowledge of God is so far removed from human knowledge as to make all comparison impossible. Again, in true Aristotelian style, Maimonides holds that those actions are to be considered virtuous which follow the golden mean between the extremes of too much and too little. The really wise man will always choose this road; and such wisdom can be learned; by continued practice it can become part of man's nature. He is most truly virtuous who has reached this eminence, and who has eliminated from his own being even the desire to do wrong
The daring with which Maimonides treated

The daring with which Maimonides treated many portions of Jewish theology did not fail to show its effect immediately after the publication of the 'Guide' His rationalistic notions about revelation, his allegorizing interpretation of Scripture, his apparent want of complete faith in the doctrine of resurrection, produced among the Jews a violent reaction against all philosophical inquiry, which lasted down to the times of the French Revolution. Even non-Jews looked askance at his system. In Montpellier and in Paris, his own Jewish opponents, not content with having gotten an edict against the use of the master's writings, obtained the aid of the Church (for the 'Guide' had been translated into Latin in the 13th century), and had it publicly consigned to the flames. But all

this was only further evidence of the power which Maimonides wielded. The Karaites copied it; the Kabbalah even tried to claim it as its own. Many who were not of the house of Israel, as Thomas Aquinas and Albertus Magnus, acknowledged the debt they owed the Spanish rabbi; and Spinoza, though in many places an opponent, shows clearly how carefully he had studied the 'Guide of the Perplexed' Consult Yellin and Abrahams, 'Maimonides,' and the authorities there mentioned; Neumark, 'Geschichte der judischen Philosophie des Mittelalters' (Vols. I–II, Berlin 1907–10).

GUSTAV GOTTHEIL.

MAIN, mān, Hubert Platt, American composer and editor b Ridgefield, Conn, 17 Aug. 1839; d. 7 Oct. 1925. He was educated in the public schools and for 59 years was editor of song collections and other publications for church, Sunday school and college use, besides composing many songs and hymns His works include 'Gems of Song for the Sunday School' (1901); 'Gloria Deo' (1901); 'Devotional Songs' (1903); 'Hallowed Hymns' (1907); 'Bixby's Home Songs' (1909); 'Hebrew, Hymnal' (1910); Ode Book, 'Eastern Star' (1911); 'Mission Hymnal' (1911-14); 'Quartettes and Choruses—Male Voices' (1912); 'Hamilton College Songs' (1915). He also compiled 'A Dictionary of American Musicians and Poets.'

MAIN, mān (Ger. mīn), or MAYN, a river of Germany, which has its source in the northeastern part of Bayaria, about 13 miles northwest of Bayreuth. It flows northwest to the border of Bayaria, and then makes a succession of remarkable zigzags, continuing, however, in a westerly direction, till it reaches the border of the grand-duchy of Hesse, which it enters It then flows circuitously west, partly forming the boundary between Hesse and the Prussian province of Hesse-Nassau, and joins the Rhine a little above the town of Mainz, after a course of over 300 miles The principal cities which it passes are Wurzburg, Aschaffenburg and Frankfort. It is navigable for about 200 miles, and by improvements the largest Rhine steamers can ascend to Frankfort. By means of King Ludwig's Canal it affords through navigation to the

MAINE, mān, Sir Henry James Sumner, English jurist. b. Caverham Grove, Reading, England, 15 Aug. 1822; d. Cannes, France, 3 Feb. 1888. He was educated at Cambridge, where he was regius professor of civil law 1847-54. He was in India as legal member of the council, 1862-69. On his return, in 1869, he was appointed professor of jurisprudence at Oxford, and held this post till 1878. He was appointed master of Trinity Hall, Cambridge, 1877, and professor of international law at Cambridge, 1887-88. Among his more noted works were 'Ancient Law' (1861), an epochmaking book; 'Village Communities' (1871); 'Popular Government' (1885). Consult Duff, 'Sir Henry Maine: a Brief Memoir of his Life' (1892).

MAINE DE BIRAN, mān de bē-rön, François Pierre Gonthier, French philosopher: b Bergerac (Dordogne), 29 Nov. 1766; d. Paris, 16 July 1824. He entered the Life Guards of Louis XVI in 1785, was present at Versailles on 5-6 Oct. 1789, but was not concerned in the Revolution He opposed Napoleon in the latter part of his reign, and became a legitimist at the Restoration His chief philosophical essays are 'Influence de l'habitude' (1803); 'Sur la décomposition de la pensée'; 'Sur l'apperception immédiate,' and 'Rapports du physique et du moral' Very little of his writing appeared during his lifetime, but in 1834 some of his essays were published by Victor Cousin who in 1841 published a more complete edition. The publication of his important writings by E. Naville in 1859 made possible the first connected study of his philosophical development. Maine de Biran's importance as a philosopher is chiefly due to his giving the direction to philosophic speculation afterward developed in the school founded by Cousin. Consult Naville, E., 'Maine de Biran' (3d ed, Paris 1874); Couaillhac, M, 'Maine de Biran' (Paris 1905).

MAINE, the name given as early as 1622 to distinguish the main land from the islands. It was called in the Mason and Gorges Patent "the Mayn Land of New England," and in the great charter "Province of Maine" It is one of the New England group of North Atlantic States and the most easterly State of the Union. It is between lat. 43° 4′ and 47° 28′ N, and between long 66° 57′ and 71° 7′ W. It is bounded on the north by Quebec and New Brunswick, provinces of Canada, on the east by New Brunswick and the Atlantic Ocean, on the south by the Atlantic and on the west by the State of New Hampshire and the province of Quebec. Its greatest extent is from north to south; its greatest length about 303 miles and its greatest width about 212 miles; area, 33,215 square miles, of which 2,175 square miles are water surface. Maine is as large as all the rest of the New England group lacking 385 square miles, and it is the 37th in size among the States of the Union.

Topography.— While its northeastern and a portion of its southwestern boundary lines are straight, its others are irregular, especially its coast line, which, fringed by islands, is indented by numerous bays, giving it a shore length of over 2,000 miles, though a direct line drawn from its two extremities would be but about a tenth of its real length. This irregular coast line, bold and rugged from its eastern extremity until it reaches Penobscot Bay, becoming lower as it approaches the south, is most picturesque throughout its entire length, much of it being bordered by sandy beaches and thick forests reaching to the water's edge There are more good harbors on the coast of Maine than on that of any other State on the

Atlantic seaboard

There are two general mountain slopes in Maine, the highest part extending across the State from north of the source of the Megalloway River in the west, northeast to Mars Hill. South of the main divide is Mount Katahdin, 5,385 feet in height; Mount Abraham, 3,387; Saddleback, 4,000, and Mount Blue, 3,900 feet in height, all in Franklin County. Green Mountain on Mount Desert Island is 1,800 feet high, and is one of the numerous peaks more or less conical in form, isolated or in clusters, comparatively bare of soil and densely wooded about their bases. There is no long range of mountains in the State.

Hydrography.— That portion of the State north of the main divide is drained almost wholly by the Saint John River and its tributaries, and the part south of the main divide is drained chiefly by the Androscoggin, Kennebec, Penobscot and Saint Croix rivers. The basin of Saint John River has an area of about 7,425 square miles The head-waters of this river are in the northwestern part of Maine and the eastern part of Quebec, and it flows north by east for some distance past Saint Francis on the north to the extreme northeastern boundary, where it makes a turn and flows generally southeast through New Bruns-wick to the Bay of Fundy. The largest Maine tributaries of the Saint John are the Aroostook and the Allegash The waters of a large number of the lakes of Maine find their outlet through the Saint John. The rivers south of the main divide flow generally south to the ocean. The source of the Kennebec is about 2,000 feet above the sea, of the Penobscot over 2,300 feet, of the Androscoggin about 3,000 feet and of the Saco in the southwest nearly 2,000 feet. They, together with their tributaries, are swiftly flowing streams, in many places passing over rocky beds which form rapids and falls and furnish extensive water powers. From the report of the Maine State Water and Storage Commission it appears that Maine ranks third among the States of the Union in developed horse power which is estimated to be in excess of 400,000 horse power Its storage facilities are estimated at 400,000 horse power more, which, with over 1,000,000 undeveloped horse power, make a total of over 1,800,000 possible water horsepower. It is among the greatest of the State's assets. Attempts on the part of interests outside the State to gain control of this power led to the enactment of measures prohibiting the transmission of hydro-electric power beyond the State's borders. Efforts were made in the years following to obtain a modification of this policy, but they failed, and this has become the fixed policy of the State. An interesting development was the plan of Duncan C Cooper to utilize the enormous power generated by the tides of the Bay of Fundy. By referendum, in 1925, the State gave its consent to the distribution of power thus obtained be-yond the borders of the State. The flow of the tide is so great on the coast that it has been estimated "that with suitable wheels it can be operated 16 hours out of the 24" There are about 1,620 lakes in Maine, a large number of which are near the sources of the rivers. The surface of the lakes and rivers constitutes nearly onetenth of the whole area of the State. Moose-head Lake is the largest in the State. (For de-

Geology.—The nature of the geological formation of Maine shows that it belongs to one of the oldest parts of the United States. The marks of the Glacial period may be plainly traced in several parts of the State; the changes in extent and form of the river hads changes in extent and form of the river beds and lakes are shown by the rock formation of the vicinity and the nature of the deposits which were brought from the mountains to the valleys. The northern portion of the State belongs to the Devonian period and the region about Penobscot Bay to the Silurian. In the southern part of the State are fossiliferous clays. There are a number of low ridges which evidently were once portions of mountain ranges, but which usually formed angles with the two great ranges that at one time extended across the State. Granite, slate and marble ex-

ist in large quantities
Soil.—The soil of the State shows the effects of the Glacial period as much as the rocks; the greater part of the surface is till and various forms of glacial débris. The old lake bottoms, now dry land, are largely alluvial and in these places the soil is very fertile. In such localities there are extensive agricultural lands.

Minerals and Mining.—Granite is one of the most important wealth producing minerals of the State. Along the coast and inland for some distance there are large areas of granite outcrop. It is found in such quantities near tide water that quarrying and shipping are comparatively easy and inexpensive. The feldspar and quartz are easily separated Hallowell, Dix Island, Vinal Haven and Freeport furnish the largest quantity. The capitol at Albany, N. Y, and the Metropolitan Museum of Art, New York City, are built of granite from Hallowell. Crystalline limestone and marble are found in several places; in the southwestern part of the State the deposits are quite extensive. Slate of good quality is found in the central part of the State. It is quarried for table tops, blackboards, roofing and for mantels. The slate from Piscataquis County is remarkably pure, capable of being split into thin plates, and in color a deep blue-black Silica and feldspar of an excellent quality are found in several places. Some of the products made in whole or in part from silica and feldspar are glass, porcelain, scouring soap, sandpaper, earthenware and woodfiller. The silica is found in vein-quartz in some of the crystalline rocks Tourmalin is found in Oxford County in large and beautiful crystals. Some of the other minerals are iron, copper, zinc, arsenic, manganese, tin, silver, gold, antimony, pyrites and beryl. The value of all the minerals produced in Maine in 1938, according to the United States Bureau of Mines, according to the United States Bureau of Mines, was \$3,548,638, as compared with \$4,129,391 in 1937. Clay products were valued at \$210,814 in 1938. The stone production in 1938 was valued at \$1,161,535, against \$1,546,037 in 1937. Sand and gravel in 1938 totaled 3,802,704 short tons valued at \$968,766.

There are in the State nearly 30 mineral springs which are known and used; 10 of them are in Androscoggin County. The State reports about 30 springs with an output of about 1,850,000 gallons. The most noted of these is the Poland spring situated in the town of that

the Poland spring situated in the town of that name.

Climate.--The climate is cold a considerable part of the year, snow covers the ground from three to five months. The summers are short; in the southern part of the State there is not more, usually less, than five months for the maturing of crops. The extensive forests have been a protection, and with the good river drainage and the sea breezes have tended to make the climate most healthful A fair average of the mean temperature in January is 15° F; in May 52°; in July 68°; in October 51°; in December 22°. The average temperature in the whole State is in summer about 62.5° F. and in winter 20° F

Flora.—The trees and plants common to the northeastern part of the United States flourish

here. In the southern part are fine grasses, hardy fruits and a varied shrubbery. The strawberry, blackberry, raspberry, blueberry, thorn-apple and gooseberry grow in all parts of the State. (See Forests and Agriculture).

Fauna. Maine has a large number and variety of animals, among which are bear, caribou, deer, moose, fox, beaver, sable, marten, mink, weasel, squirrel, rabbit, porcupine and wildcat. Wild geese, duck, teal; plover, gulls and various other sea fowl are found about its lakes and sea coasts; partridges, robins, bobolinks, orioles and other birds belonging to the north temperate zone are common. The waters of Maine abound with fish in great variety.

(See section Fisheries).

Forests.— Maine is known as the "Pine Tree State" because of the large extent of pine forests which once existed within its limits. The majestic "mast pine," which the State once furnished for many ships, has almost become a thing of the past, yielding to the demands of commerce. The greatest part of the State is covered with forests; about 65 per cent of the State's land area is woodland. The northern and central parts are forest; in the southern part along the coast and along the navigable streams the land is cleared and cultivated. Trees grow rapidly. Denuded tracts, unless cultivated soon, send up an undergrowth of seedlings which become trees of fair size in the course of a few years. Most of the lumber of Maine used in the manufacture of pulp and paper has been taken from the drainage of the Androscoggin, Kennebec and Penobscot rivers, in about the following proportions: 42 per cent from the Androscoggin; 25 per cent from the Kennebec and 33 per cent from the Penobscot. The total area from which the whole pulp lumber consumed in the State has been taken has been estimated at 4,741,000 acres, leaving more than one-half the entire region from which no pulp wood of any consequence has ever been removed. There has been estimated standing 21,239,000,000 feet of spruce alone, besides an almost equal quantity comprising pine, cedar, hemlock, poplar and various species of hard wood. The annual growth is considered sufficient to warrant the cutting of 600,000,000 feet of spruce timber each year, without de-pleting the supply. The forest commissioner states that it is safe to reckon that there will be from 11,000,000 to 12,000,000 acres of land in the State that will be lumber producing for all time. There are now being taken annually upwards of 30,000,000 feet of white birch from Maine forests. The white birch area is a wide belt extending entirely across the State. Though used for many purposes its greatest utilization is by spool factories which produce about 800,-000,000 spools, valued at more than \$1,000,000. Besides being used in the production of spools a large quantity is shipped to Europe in spool bars. A variety of small articles are also manufactured from it, as baskets, furniture, office equipments, etc. The science of forestry is being employed extensively in the preservation of

timber by private corporations

Fisheries.—The rivers and lakes are well
stocked with fish; the State is considered the
sportsman's paradise
Some of the varieties
are the speckled trout, sturgeon, pickerel, salmon, bass and bream. Lobsters, clams and mussels are in large quantities clare the coast sels are in large quantities along the coast, and

in the bays and inlets are bluefish, rock-cod, sculpins, cunners, flounders and others In the off-shore waters there are cod, herring, mackerel, haddock, hake, porgy, menhaden and pollock, which are caught in large quantities. One species of herring, the Clupea harengus, furnishes a large portion of the fish used in the sardine-canning establishments of Lubec, East-port and other places. The fisheries of Maine rank second in value among the fisheries of New England, but more men are engaged in New England, but more men are engaged in this industry in Maine than in any other New England State except Massachusetts. The commissioner of sea and shore fisheries estimates the number of persons dependent upon the fisheries at 50,000 and the value of the product at \$5,786,000; 1935, \$3,856,000.

In 1892 the lobster fisheries product was \$002,855, this amount being greater than for all

\$992,855, this amount being greater than for all lobsters in all the other New England States The law passed in 1895 for the protection of the lobster fisheries greatly curtailed this branch of the fishing industry, as it prohibited the taking of lobsters less than 10½ inches in extreme length. This caused the removal of canning establishments to Nova Scotia, New Brunswick and the Magdalen Islands. The government experiment stations plant large quantities of lobster fry along the coast. The value of the catch averages annually about \$3,500,000. Clam fishing ranks next in importance; canning clams is a prominent industry, also the prepara-tion of smoked herring. Salmon fishing is largely in the Penobscot and Kennebec rivers. The fishery trade is centred chiefly at Portland, Rockland and Vmal Haven. The sardine fisheries are located in Washington, Hancock, Lincoln and Cumberland counties. The word «sardine» refers to young herring which are caught off the coast of Maine in great abundance and canned. Maine is the second State in this industry, its product being exceeded only by that of California The value of the sardine industry amounts to about \$1,500,000 annually.

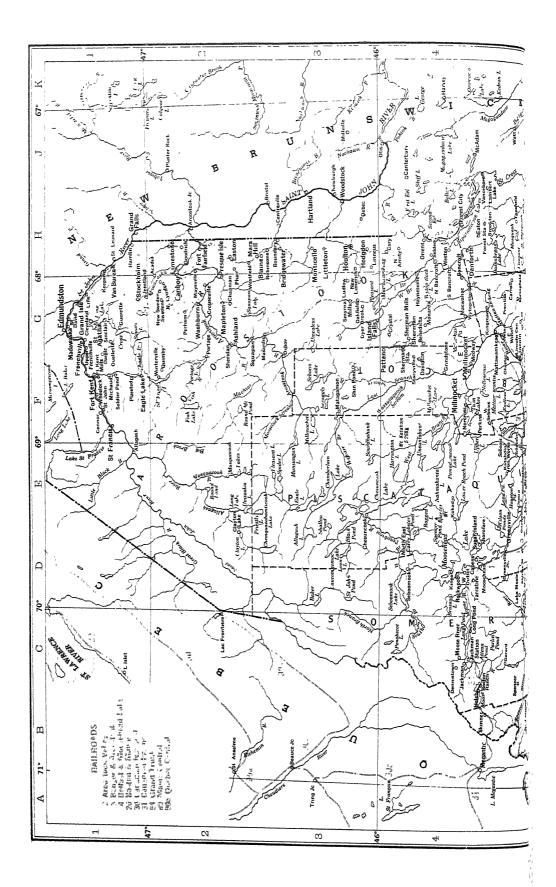
Agriculture and Stock Raising.—The soil

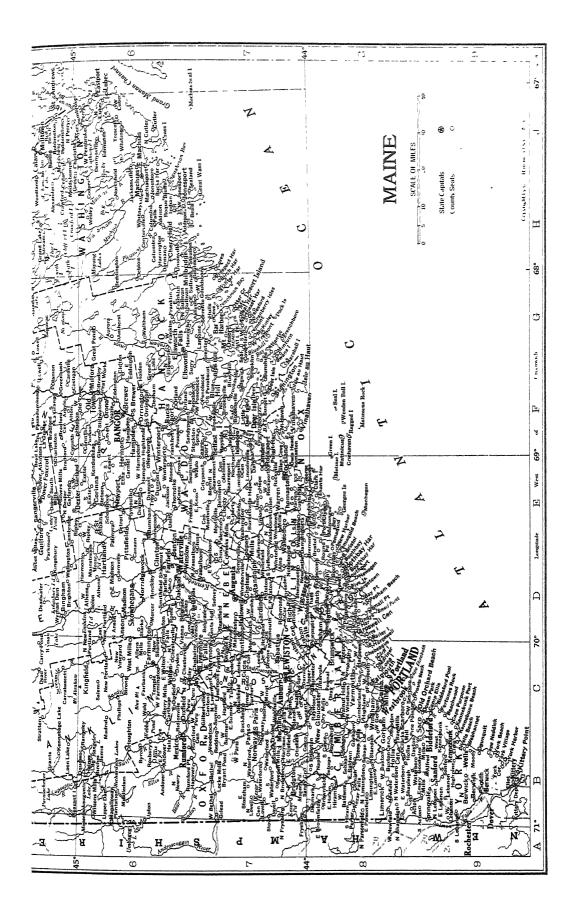
of a considerable portion of the State is not adapted to agriculture, owing to the large acreage of forest land. But a little over 33 per cent is farm land and of that nearly one-third is not improved. The most fertile lands are in the river valleys, the largest acreage being in the northeastern part of the State in the Aroostook Basin. The farms average in size about 108.3 acres, and about 5 per cent of the farms are occupied by tenants (Government Census Bulletin for 1 April 1940). The owner living on the farm pages more introduced methods of on the farm means more intensive methods of and a careful rotation of crops. The cereal crops, especially wheat, have decreased in extent owing to Western competition, but in Aroostook County they are increasing. The Federal census of 1940 shows that in this county the cereals occurred three-fourths the total of the cereals occupied three-fourths the total of the cereal acreage of the State. The crop of oats, once large, has also decreased; yellow corn, formerly cultivated on all the farms, never occupied much area and is now raised principally for fodder The finest sweet corn in the world

parts of the country. The green-corn industry originated with Isaac Winslow who invented the process in 1838-39. On 8 March 1853 he applied for 3

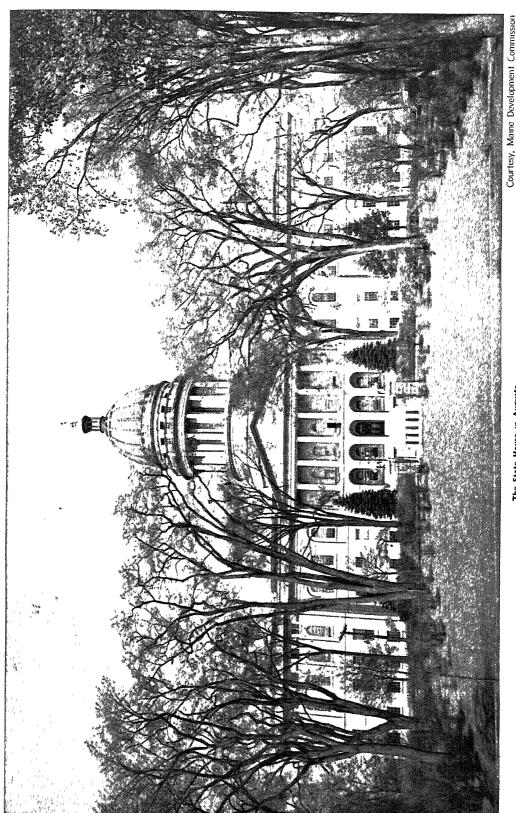
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Boundary, (H3)		334	Eaton, (H4) 135	Highpine, (B9) 161 Hinckley, (D6) 127	Lovell, (B7) 647 Lowell, (F5) 161
Bowdonham, (D7) 915		136	Eddington (F6) 571	Hiram, (B8) 787	Luhec, (K6) 1,636
Bowerhank, (E5) 49 Boyd Lake, (F5)		235 320	Edgecomb (D8) 411 Edmunds (J6) 342	Hodgdon, (H3) 1,076 Holeh, (C4) 114	Ludlow, (G3) 343
Brauford (F5) 734	Crystal, ☐ (G4)		Eliot, □ (B9) 1 932	Holes, (C4) 114 Holls Center, (B8) 115	Machias, (J6) 1,411 Machiasport, □ (H6) 818
Bradford Center,	Cumberland Cen,		Ellsworth, (F6) 3,911	Hope (E7) 524	McKinley, (G7) 273
(F5) Bradley, (F6) 506	(C8) Cumberland Mills,		Ellsworth Falls,(G6) Elms, (B9)	Houghton, (B6) Houlton, (H3) 6 200	Macwahoc, ☐ (G4) 242
Bremen, _ (E8) . 383	(C8)		Emery Mills (BO) 120	Howland, (F5) 1,091	Madawaska, (G1) 2,184 Madison (D6) 2,581
Breaer, (F6) 6,510	Cundys Harbor, (D8)		Enfield, (F5) 979 Etna, (E6) 460	Hudson, (F5) 372	Madrid, □ (B6) 214
Bridgewater, (H3) Bridgton, (B7) 1,636		151 362	Eustis, (E6) 460 Eustis, (B5) 707	Hulls Cove, (G7) 217	Magalloway
Brighton, □ (D5) 183		481	Exeter, (E6) 751	Intervale, (C8) Island Falls, (G3) 1,058	Plantation ☐ (B6) 84 Manchester, ☐ (D7) 626
Bristol.□ (E8) .1,355 Brioklin,□ (F7) 656	Daigle, (G1)		Fairbanks, (C6)	Isle au Haut, [] (F7) 97	Manchester, ☐ (D7) 626 Mapleton, ☐ (G2) 1,354 Mariner (C8)
Braskin,□ (F7) 656 Brasks,□ (E6) 744		667 813	Fairfield, (D6) 3,420 Falmouth, □ (C8) 2,883		
Brooksville, ☐ (F7) 805	Danville, (C7)	230	Farmington, (C6) 2,024	Islestord, (G7) 157 Jackman,□ (C4) 1,069	Mars Hill, (H2) 1,157 Masardis, ☐ (G3) 601
Brownheld. (B8) 741	Darkharbor, (F7)	210	Farmington Falls,	Jackman Sta., (C4) 217	Matagamon, (F3).
Brownfield, (B8) 741 Brownville (E5) 1,914	Davidson, (F4) Davidson, [] (B8)	454	(D6) Fayette, ☐ (C7) 438	Jacksonville, (J6) 127 Jav. (C7) 2,858	Mattawamkeag,
Brownville Jc (E5) 1,131	Dead River, ☐ (C5)	76	Five Islands, (D8) 192	Jefferson, □ (D7). 938	(G4) 674 Maysville, (G2)
Brunswick (C8) 7,003 Bryant Pond, (B7), 489	Deblois, (H6)	55	Flagstaff, (C5) 143	Jimpond (B5)	Mechanic Falls,
Buckfield, (C7) 903	Dedham, ☐ (F6) Deer Isle. ☐ (F7) 1.	293 303	Forest City, (H4) 67 Forest Station, (H4)	Jonesboro, ☐ (J6) 479 Jonesport, (H6) 1,389	(C7) 1,622 Meddyhamna (15) 101
Bucks Harbor, (J6) 115	Denmark, ☐ (B8)	532	Ft Fairfield, (H2) 2,693	Keegan, (G1) 832	Meddybemps, □ (J5) 101 Medford, □ (F5) 213
☐ Population of Tox	unship.		County seat.		, , -y ,, 240

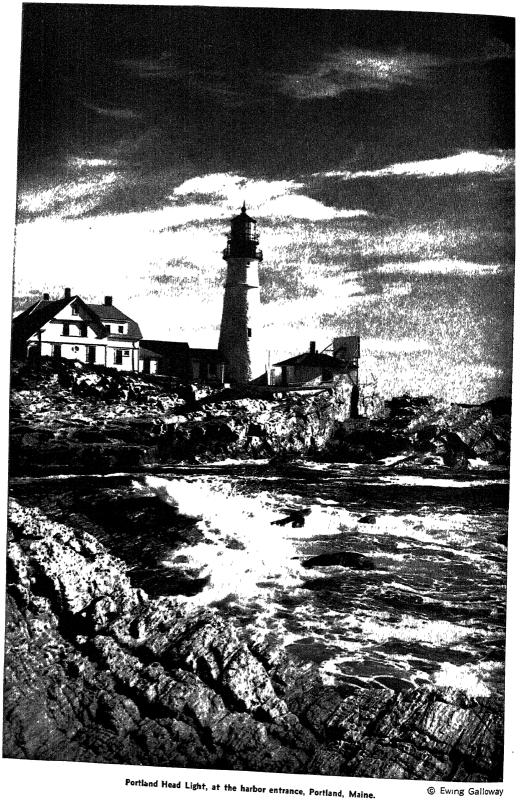




1411 (11 /10			T. (CA)	S Lincoln, (G5)	Walnut Hill, (C8)
\featway = (G4) 62.	3 '	∨ Waterhoro, (B8)	Riley, (C6)	S Lincoln, (G5) S Monmouth, (D7)	Waltham, \square (G6)
Medwar, T (G4) 62. Mercer, T (D6) 38		Waterford, (B7) 278	Ripley, (E5) 324	S Orrington, (F6) 356	Watren (7/Et)
Mexico E6 3,79		\ Wayne, (C7) 153	Robinsons, (H3) 200	S Paris, (C7) 2,191	Washburn, (G2)
Munaud, (F1)	,	∨ Whitefield, (D7)	Rockland, (E7) 8,899	S Penobscot, (F7) 347	Washington, □ (E7)
Militard, (16) 88	6	N 11 Indham, (C8) 297	Rockport, (F7) 964	Southport, □ (D8) 405	Waterboro (7) (Pa)
Villandre (His) 62		N. Yarmouth, (C8)	Rockwood, (D4) 317	S Portland, (C8) 15,781	Waterboro, ☐ (B8) Waterford, ☐ (B7)
Millinnel et F4 596	8	Norway (B7) .2,733	Rome, (D6) 418	S Robbinston, (J5)	
Milito vn J5		Norway Lake, (B7)	Roque Bluffs, (H6)		Water ville, (E6)
Villo F51 3,00		Oakfield, (G3) 667	Round Pond (E8) 543	S Sanford, (B9)	Wayne, □ (D7)
Minot = (F5) 3,000 Minot = (C7) 67		Oakland, (D6) 1,586	Roxbury, □ (B6) 346	S Thomaston, (E7) S Union, (E7) 241	Webhannet, (C9)
Minturn G7 23		Occan Park, (C9)	Rumford, (B6) 8,447		Weeks Mills, (E7)
Monarda (G4)	. 1	Ogunquit, (B9) 615	Rumford Center	S Waldoboro, (E7)	Welchville, (C7)
Monhegan, I E8 11	5 (Olamon, (F5) 225	(B7)	S Warren, (E7)	Weld,□ (C6)
Monmouth (D7) 1,50		Old Orchard Beach,	Rumford Pt , (B6) 125	S Waterford, (B7) 271	Wellington □ (D5)
Montue E61 66		(C9) 2,149	Sabattus, (C7) 1,161	South West Harbor,	Wells (B9) Wells Beach, (C9)
Vienson E5, 56		Old Town, (F6) 7,688	Saco, (C9) 8,631	(G7) 828	Wells Beach, (C9)
\funtice'lo 2 'H3) 150		Onawa, (E5) 57	Saint Agatha, (G1)	S Windham, (C8) 817	Weslev I (HA)
Viontville JIE71 60		Oquossoc, (B6) 117	St Albans, □ (E6) 950	Spencer, (C5)	West Athens, (D6)
Mouly, (B9)		Orient, ☐ (H4) 147	St David, (G1) 751	Springfield, (G5) 442	W Baldwin, (B8)
Mouschead (D4) I		Orland, (F6) 1,015	St Francis, ☐ (E1) 1,489	Springvale, (B9) 2,899	W Bath, □ (D8)
Moose River, (C4) 20		Orono, (F6) 3,052	St George, □ (£7) 1,550	Squapan, (G2)	W Bethel (B7)
Morrell Z E7 32		Orrington, (F6) 1,517	St John, □(F1) 628	Stacyville (F4) 717	W Boothbay
Vit Desert [(G7) 2,04		Orrs Island, (D8) 121	Salem, □ (C6) 78	Standish, ☐ (B8) 1,472	Harbor, (Ď8)
Vit Vernon = (D7) 65		Otisfield [(B7) 488	Sandy Creek, (B7)	Starks □ (D6) 426	Westbrook, (C8) 11
Naples T. B8/ 67		Otter Creek, (G7) 157	Sandypoint, (F7) 257	Steep Falls, (B8) 551	W Brooksville (F7)
		Ouellette, (G1)_	Sanford, (B9) 10,765	Stetson, □ (E6) 408	W Buxton (BR)
Newagen, (D8) 9 Newburgh, 7 (F6) 59		Owls Head, (F7) 609	Sangerville (E5) 660	Steuben, □ (H6) 690	W Enfield, (F5)
Newcastle 7 (D7) 99		Oxbow, (G3) 178	Saponac, (G5)	Stillwater, (F6) 656	W Farmington, (C6)
Newcastle, (D7) 99 Newfield, (B8) 47		Oxford, (C7) 619	Scarboro, ☐ (C8) 2,842	Stockholm, (G1) 622	Westheld,□ (G2)
		Palmero (E7) 527	Seal Cove, (G7) 487	Stockton Sprs , (F7)	W Franklin (G6)
New Gloucester, (C8)		Palmyra, (E6) 934	Seal Harbor, (G7) 251	Stonington, (F7) 714	W Gardiner, (D7)
New Harbor, (E8) 44	:1	Paris, (B7) 4,094	Searsmont, ☐ (E7) 542	Stow, (A7) 153	W Gouldsboro, (G7)
New Limerick, (G3)		Parkman, (D5) 581	Searsport, (F7) 698	Stratton, (C5) 553	W Jonesport, (H6)
Newport, (E6) 1,37		PassaJumkeag, (F5)	Sebago, □ (B8) 518	Strong, (C6) 597	W Kennebunk (B0)
New Portland, (C6)		Patten, (F4) 1,007	Sebago Lake, (B8) 200	Sugar Island, (D4)	W Lebanon, (B9)
New Sharon, □ (C) 76			Sebec, (E5) . 372	Sullivan. □ (G6) 801	W Lubec, (J6)
New Sweden (G2) 84	+		Sebec Lake, (E5)	Sumner, □ (C7) 541	West Mills, (C6)
New Vineyard, (C6)		Pemaguid, (E8) 289 Pemaguid Beach,	Sebec Station, (E5) 146	Sunset, (F7) . 257	W Minot, (C7)
Noblehoro, 7 (D7) 66)3		Seboeis, (F5) 80	Sunshine, (G7)	W Newfield, (B8)
Norcross, (F4)		(E8)	Seboomook, (D4)	Surry, □ (F7) 497	West Old Town, (F6)
Norridgewock, (D6) 61	10	Pembroke ☐ (J6) 1,029 Penobscot,☐ (F7) 680	Sedgwick, □(F7) 718	Swans Island, (G7) 425	Weston, □ (H4)
North Amity, (H4)		Penobscot, (F7) 680	Selden, (H4)	Swanville, (E6) 373	W Outlet (D4)
	76	Perham, (G2) 689	Shapleigh, (194) 290	Sweden, □ (B7) 225	W Domo (D7)
N Bancroft, (G4)		Perkins, (F4)	Shawmut, (D6)	Sweden, (G2)	W Pembroke, (J6)
N Belgrade, (D7) 15	0/	Perry, □ (J6) 713	Sheepscott, (D7)	Tarratine, (D4) 11	W Penobscot, (F7)
	59	Peru, (C6) 965	Sheridan, (F2) 551	Temple, (C6) 252	W Peru, (C7)
N Bradford, (F5)		Phair, (G2)		Tenants Harbor,	W. Poland, (C7)
	53	Phillips, (C6) 782	Sherman, ☐ (G4) 1,058 Sherman Mills, (G4) 843	(E8)	W Rockport, (E7)
N Brookville (F7)		Phippsburg, (D8) 1,020	Sherman Station,	The Forks, □ (D5) 123	W Scarboro, (C8) 1
N Buckfield, (C7)		Pittsfield, (E6) 2,578		Thomaston, (E7) 1,569	W Seboois, (F4).
N Cutler, (J6)		Pittston, □ (D7) 1,114	(F4) . Shin Pond, (F3)	Thorndike, \square (E6) 478	W Sumner, (C7)
N Dexter, (E5)		Plaisted, (F1) . 17	Shirley Mills, (D5) 237	Thorofare, (D4)	W Tremont, (G7)
N Dixmont, (E6)		Pleasant Island, (B5)		Topsfield, (H5) 221	W Winterport, (E6)
North East Carry,		Pleasant Pond, (D5)		Topsham, (D8) 1,189	Wheelock, (F1)
(D4)		Plymouth, (E6) 462			Whitefield, (D7),
Northeast Harbor,	75	Poland, □(C7) 1,441	Sinclair, (G1) 54	Tremont, \square (G7) 1,118 Trenton, \square (G7) 403	Whiting, (J6)
	75	Poland Spring, (C7) 162	Skowhegan, (D6) 5,606 Small Point, (D8)	Trenton, \square (G7) 403 Trescott, \square (J6) 395	Whitneyville, ☐ (H6)
N Ellsworth, (G6)	E7	Popham Beach, (D8)	Smithfield, □ (D6) 353	Trevett, (D8) 238	Willimantic (E5),
	57	Portage, (G2) Port Clyde, (E8) 312	Smyrna Mills, (G3) 437	Troutdale, (D5)	Wilsons Mills, (B6)
N Fryeburg, (B7) . N Gorham, (C8)		Porter, (B8) 892	Soldier Pond, (F1)	Troy, (E6) 582	Wilton, (C6) . 11
	60	Portland, (C8) 73,643	Solon, □ (D6) 773	Turner (1 (C7) 1 415	Windsorville, (D7)
N Isleshoro, (F7)	JU	Pownal, (C8) 575	Somerville, □ (D7) 266	Turner, (C7) 1,415 Turner Center, (C7) 191	Winn, (G5)
	65	Prentiss, \square (C5) . 337	Sorrento, ☐ (G7) 188	Union, □ (E7) 1,150	Winnecook, (E6)
a toring Nan Yang)	79	Presque Isle, (H2) 5,456	South Acton, (B9)	Unionville, (H6) 149	Winslow, (D6) 2,6
N Limington, (B8)		Princeton, (H5) 1,009	S Bancroft, (G4)	Unity, (£6) 935	Winslows Mills, (E7)
	75	Prospect, □ (F6) 430	S Berwick, (B9) 1,830	Upper Dam, (B6) 8	Winter Harbor, (G1)
	84	Prospect, ☐ (F6) 430 Prospect Harbor,	S Berwick, (B9) 1,830 S Blue Hill, (F7)	Upper Frenchville,	Winterport, (F6)
N Luhec, (J6) 5	64	(H7)	S Brewer, (F6)	(G1)	Winterville, (F2)
N Lyndon, (G2)	7.7	Prouts Neck, (C9) 59	S Bridgton, (B8) . 298	Upper Gloucester,	Winthrop, (C7)
N New Portland,		Pulpit Harbor, (F7)	S Bristol, □ (D8) 582	(C8)	Wiscasset, (D7).
(C6)		Quimby, (F2)	S Brooksville, (F7)	Upton, ☐ (B6) 174	Woodland, (H5)
N Newry, (B6)		Randolph (D7) 1.501		Van Buren, (G1) . 3,570	Woodstock, (B7)
	97	Rangeley, (B6) 974	S China, (D7) 336	Vanceboro, (H4) 612	Woolwich, (D8) [.]
	85	Raymond, (B8). 506	S Casco, (B8) 89 S China, (D7)	Vassalboro, □ (D7) 1,931	Wyman Dam, (D5).
	16	Readfield, (D7) 986	S Deer Isle, (F7 .	Veazie, (F6)	Wytopitlock (G4)
N Shapleigh, (B8). 1	96	Red Beach (15)	S Exter, (E6)	Vienna, (10) 301	Wytopitlock, (G4) Yarmouth, (C8)
N Shapleigh, (B8). 1 N Sullivan, (G6). 2	76	Red Beach, (J5) Richmond, (D7) 1,398	S Harnswell (C8) 241	Vinalhaven, (F7) . 1,085	York Beach, (B9)
N Sullivan, (G6). 2 N. Turner, (C7) 2	200	Richmond Corner,	S Hiram, (B8) 213	Waite, ☐ (H5) 152	York Corners, (B9).
N. Vassalboro, (D7)		(D7)	S. Hollis, (B8)	Waite, □ (H5) 152 Waldo, □ (E7) 340	York Harbor, (B9)
N Waldoboro, (E7)		Ridlonville, (C6) 347	S Hope, (E7) 273	Waldoboro, (E7) 833	York Village, (B9)
☐ Population of	F T~			21000010, (127)	TOLK THEBO! (DAIN
iii Foliation of	10	wrioruh.	County seat.		



The State House in Augusta.



© Ewing Galloway

patent for preserving fresh green corn by hermetically sealing process. In suits against infringers of the patents it appeared that the canning of corn originated in Maine at the

early dates mentioned.

Buckwheat, which produces excellent flour in a soil and climate like Maine, is still cultivated The returns from the potato crop are greater than from all the cereals. Hay of an excellent quality is marketed at good prices. Farmers living near markets are giving considerable attention to market gardening and dairying. Fine grained vegetables, sweet corn, small fruits and apples flourish and bring excellent returns. Apple orchards are increasing in number and increased attention is being given to their care and cultivation. The raising of horses is increasing, but the number of meat cattle and sheep is decreasing. The number of milch cows is increasing.

The Federal Census reports for 1940 gave the

following statistics:

Item	Census of 1940	Census of 1930
FARMS, FARM ACREAGE	AND VALUE	
Number of farms Farms operated by—	38,980	39,006
Full owners	34,887	35,468
Full owners	1,363	1,280
Managers	211	503
All tenants Value of farms (land and	2,519	1,755
buildings)\$	124 082 841	\$194,279,884
Average value per farm	\$3,183	\$4,981
Average value per farm Average value per acre	\$29 38	\$41 8 7
All land in farms, acres Average acreage per farm	4,223,297	4,639,938
Average acreage per farm	108 3	119 0
FARM LAND ACCORDING T	O USE (ACRE	s)
Cropland harvested	1,146,613	1,304,014
Crop failure	14,898	6.445
Cropland, idle or fallow	108,164	91,306 259,265
Plowable pasture	319,687	259,265
All other land	1,783,327 850,608	2,240,910 737,998
Land available for crops	1,589,362	1,661,030
(Harvested, failure, idle or	_,,,	-,00-,000
fallow, and plowable pasture)		
LIVESTOCK ON FARMS	(NUMBER)	
Horses and colts	37,464	60,827
Mules and mule colts	187	516
Cattle	215,883	224,121
Cattle		
old and over on I Jan. of	138,206	129,906
Cows and heifers milked	123,448	
Sheep and lambs	38,517	76,438
Hogs and pigs	34,780	34,166
Chickens	1,542,092	1,451,035
ACREAGE AND PRODUCTION	OF SELEC	TED CROPS
11010101010101	1929-38	
Crop	Average	1940
Corn:		
Acreage	12,000	13,000
Production—bus	481,000	507,000
Oats:	117 000	112 000
Acreage Production—bus	117,000 4,316,000	113,000 4,520,000
Hay:	7,310,000	4,520,000
Acreage	996,000	1,013,000
Production—tons	868,000	884,000
Potatoes:	169.000	165 000
Acreage	168,000 45,137,000	165,000 44,055,000
Apples:	73,107,000	44,000,000
Production—bus	567,000	752,000
	-	

Population.—On 1 April 1940, Maine had a population of 847,226, an increase of 49,803, or 62 per cent over its 1930 population of 797,423. The first census of Maine was taken in 1790 and returned a population of 96,540. The population

has increased with every census since that time, except that of 1870, passing 100,000 between 1790 and 1800, 200,000 between 1800 and 1810, 300,000 between 1820 and 1830, 500,000 between 1840 and 1850, 700,000 between 1900 and 1910, and 800,000 between 1930 and 1940. The 1940 population represents a density of 27 3 inhabitants per square mile. Twelve of the 16 counties gained in population between 1930 and 1940, York County, with an increase of 132 per cent, having had the most rapid growth There are 10 cities with populations of 10,000 or more, one (Bath) having reached this size since 1930. The following table shows the population of Maine broken down into urban, rural, male, female, white and nonwhites.

Population of Maine, 1930-40

	1930	1940
Maine	797,423	847,226
Urban		343,057
Rural	475,917	504,169
Male		427,393
Female		419,833
White		844,567
Nonwhite	2,238	2,659

New Sweden.—In 1876 a Swedish colony consisting of 50 persons was located in the northern part of Aroostook County by the Hon. W. W. Thomas, Jr, Commissioner of the Immigration. That portion of Township No. 15 upon which they were located was named New Sweden Its present number is about 1,000. It is estimated that there are now in Maine 5,000 Swedes, a large number being descendants of the Thomas colony. The success of the settle-ment, owing to the high character for thrift and industry of the colonists, has been very great.

Manufactures.—The extensive water power has been a great aid in developing manufacturing industries. Ship-building was among the first manufacturing industries of the State. The first vessel built in Maine was the Virginia. She was built by the Popham colony 1607–08, and under command of Capt James Davis sailed from Plymouth with the Somers and Gates colony for Jamestown, 1 June 1609. Bath was the chief ship-building center of the United States for over 100 years and is yet as United States for over 100 years and is yet a ship-building center of importance. Prior to the construction of steel vessels, the Maine forests supplied a large amount of the timber used in ocean vessels built in the United States and nearly half the ocean vessels of the nation, up nearly nair the ocean vessels of the flation, up to 1900, were made in Maine. The manufacture of leather is another of the leading industries. The bark of the hemlock is used in large quantities for tanning The manufacturing of cotton and woolen goods began the latter part of the 18th century and has been continued. Lewiston is the chief center of cotton manufacturing. Biddeford and Saco are extensively engaged in Biddeford and Saco are extensively engaged in manufacturing cotton goods. Woolen mills are scattered throughout the State. The oil-cloth industry was first started in Maine in 1845 by C. M. Bailey of Winthrop. Nearly all the factories are located are in least the scattering of the state of the sta tories are located near the coast, or in localities where abundant water power and good transportation lessen the cost of production and shipping. Lime and cement are important manufacturing products; large quantities of lime are made in Knox County. In 1939 there were 1,210 manufacturing establishments in the State. These employed 75,655 wage earners and turned out

products valued at \$345,368,595. The wages paid

were \$68,434,288

Industry.—Samuel Waldo. The Paper Thomas Westbrook and Richard Fry were pioneers in the paper industry of Maine, having built a mill at Presumpscot Falls, Falmouth, in 1731, and a second mill at Stroudwater in 1733. At this time there were but three paper mills in the country, two being in Philadelphia and one in Milton, Mass. R. H. Gardiner and John Savels built the third mill about 1810 In 1816 Harris and Cox Brothers built a mill at North Yarmouth, and the same year another mill was built at Union by Josiah Day which was destroyed by fire in 1843 In 1823 George Cox and Company built a mill at Vassalboro which was burned in 1848 and not rebuilt. In 1845 Day and Lyon built a paper mill at «Congin» (now Cumberland Mills, Westbrook) which was burned in 1852, and was rebuilt by the firm of S. D. Warren and Company on the site of the old mill.

The paper industry in Maine received a great impetus by the introduction of wood pulp, and the State now ranks among the first of pulp-producing States. Wood pulp was first produced in this State in 1868–69. The second pulp mill was established in 1872 at Yarmouth. Sulphite pulp was first produced in Maine in Other sulphite, soda pulp and ground wood mills have followed in rapid succession

since these dates.

There were in 1939, in Maine, 21 pulp and paper establishments in the State with an average of 3,048 wage earners, and an annual product valued at \$25,370,932. There were in 1939, 23 paper and paperboard mills which employed 7,773 wage earners and whose products aggregated \$69,278,265 in value. Woolen and worsted manufactures had 40 mills with a total of 8,786 wage earners and products valued at \$36,118,681 There is no coal and only a small amount of iron in the State and as a result the manufacturing industry is dependent upon water power Fortunately the abundance of timber and the wonderful water power available have to a great extent overcome the handicap of lack of coal The leading industries are paper and wood pulp manufacture; cotton goods; woolen goods; boots and shoes; lumber and timber products; canning and preserving fish; canning and preserving fruits and vegetables; and foundry and machine shop products. Ship-building once so important now occupies a somewhat subordinate place.

Banking Institutions.—On 1 Jan. 1941 there were 59 insured commercial banks in the State. The total assets of these institutions was \$230,-071,000, including cash balances of \$65,999,000; direct obligations of the United States government, \$38,163,000; obligations guaranteed by the United States government, \$12,017,000; securities, \$82,258,000; and loans, \$76,303,000. Liabilities included demand deposits, \$78,747,000; time deposits, \$110,873,000; capital stock, \$15,380,000; surplus \$8,427,000; and undivided profits of \$4.500. surplus, \$8,427,000; and undivided profits of \$4,-

Finances.—The following information relating to Maine's finances for 1939-40 was supplied by the State treasurer's office:

Balance in Treasury at beginning of fiscal year 1939-40 \$ 4,421,536 28 Receipts from all sources, 1939-40 \$ 45,811,164 04 \$ 50,232,700.32 Disbursements, 1939-40 \$ 45,622,565 29 Balance at beginning of fiscal year 1940-41. \$ 4,610,135.03

On 30 June 1940 the bonded debt of the State totaled \$27,400,000. There was no floating debt. The assessed value of all property in the State was \$672,089,963, of which \$569,559,706 was real property and \$102,530,257 was personal property.

Government.—The State Constitution, under

which the laws of the State are administered, was adopted by the people in town meetings held throughout the State, December 1819. To amend or change the constitution it is necessary to have in favor a two-thirds vote of both houses of the legislature and a majority of the votes cast at the next biennial election of meetof the people. A voter must be a citizen of the State, that is, no one has the right of suffrage but persons, 21 years or over, citizens of the United States, who have resided in the State, county, fown and voting district three months Persons 21 years and over who are excluded from voting are paupers, Indians who are not taxed and persons under grandworks. are not taxed and persons under guardianship. Voters who are soldiers in the State militia or regular United States army may vote when serving outside of the State. In 1884 Mame, which had enacted the first prohibition law adopted by any State in the Union, wrote into its constitution an amendment prohibiting the manufacture and sale of intoxicating liquors. This law remained in effect until after the repeal of the 18th amendment to the Federal Constitution. The capital city is Augusta, on the Kennebec River in Kennebec County; its population (1940) was 19,360.

Executive.—A plurality of the votes cast is necessary for the election of the governor, who holds office for a term of two years. His council consists of seven members elected biennially on joint ballot of the legislature, but any district prescribed for the election of senators can furnish only one councillor. The governor and council have power to grant pardons, commutations and reprieves, and to remit penalties. They also have the appointment of the judges of the Supreme Court. In case of vacancy in the office of governor, the president of the senate and speaker of the house are respectively in line of succession. The secretary of State and the treasurer are elected on joint ballot of

the legislature and for two years

Legislature.—The legislature is composed of a senate and house of representatives. There are 33 members of the senate and 151 members of the house, all elected bennually on the second Monday in September They meet in session on the first Wednesday in January next following their election. The senators are elected from senatorial districts into which the counties of the State are divided. The representatives are elected from towns. All bills relating to revenue. nues must originate in the house of representa-tives. The house has power of impeachment; but the senate conducts the trials of impeachments. The legislature may overcome the governor's veto by a two-thirds vote each of house and senate. The State has three congressmen. Judiciary.—The six judges who compose the Supreme Judicial Court are appointed for a term of seven years by the covernor and court.

the Supreme Judicial Court are appointed for a term of seven years by the governor and coun-cil. The judge of the Superior Court of Cum-berland County, which includes the city of Portland, the judges of the inferior courts, of municipal and police courts, are also appointed by the State executive and his council. The by the State executive and his council. The term of appointment of the judges of the inferior courts is seven years, and of the judges

of municipal and police courts, four years. Probate judges are chosen by the people by election and for a term of four years. The attorney-general is elected on joint ballot of the

legislature for a term of two years.

Education.—Public elementary and secondary education is free to all residents of the State between the ages of 5 and 21 years and compulsory for all between the ages of 7 and 15 years. During the school year ending June 1939, there were 4,627 public elemenetary schools in the State employing 4,706 teachers and attended by 125,422 pupils. At the same time public secondary schools numbered 216. The latter employed 1,317 teachers and were attended by 39,066 pupils.

There is a school of education connected with the University of Maine at Orono and a department of education in Bates, Colby, and St. Joseph colleges. The State Normal School at Farmington offers four years of training in the field of home economics, leading to a degree of BS. in Home Economics, and three years of training in the field of elementary teacher preparation. Western State Normal School at Gorham offers a four-year course leading to the degree of BS. in elementary education and a four-year course in manual training, this, too, leading to a special degree in industrial arts. A junior high school teacher-training course is also offered in this institution. Aside from these two, the State has Washington State Normal School at Castine; and Aroostook State Normal School at Castine; and Aroostook State Normal School at Presque Isle. These three offer regular three-year teacher-training work. A sixth institution is known as Madawaska Training School and is located at Fort Kent

There are several parochial schools in the State in which there are approximately 17,000 pupils enrolled. Maine has approximately 65 institutes and academies doing work on the secon-

dary school level.

İnstitutions of the higher learning in the State, in addition to the University of Maine at Orono, include Bates College, a co-educational institution located at Lewiston; Bowdoin College (for men) located at Brunswick; Colby College, coeducational, at Waterville; Nasson College (for women) at Springvale; St. Joseph's College (for women) in Portland; Bangor Theological Seminary (Congregational) and Northern Conservatory of Music, both located in Bangor. There are also four junior colleges—Ricker Junior College, Houlton; Westbrook Junior College, Portland; and Portland Junior College located in the same city; and Kent's Hill Junior College at Kent's Hill.

A public school fund was created in 1828. Certain parcels of land were set aside and money received for the sale of these lands; timber and grass taken therefrom formed the basis for a public permanent school fund. A three and a third mill tax on the valuation of the State, one-half of the tax on savings banks and trust companies, and the interest on the permanent school fund go to make up the resources for carrying on the public school program in Maine.

The compulsory school law which covers the ages from 7 to 15 is strictly enforced. The district school system has been abolished and the public school program comes under the jurisdiction of the municipality in which it is located.

Since 1901 the State, through its legislature,

has provided special aid for instruction in academies and institutes located within the State. Towns not maintaining a Class A secondary school must provide free tuition for pupils who are eligible for admission to high school.

Summer schools for elementary teachers are maintained by the State under the supervision of the commissioner of education. The colleges also make provisions for the training in academic and professional fields for teachers teaching in the secondary schools. Teachers' certificates are required and issued by the State

department of education.

All school systems come under the immediate supervision of professional superintendents of schools who must meet high standards of preparation, both academic and professional, and pass rigid examinations before they can be certified. Several municipalities may join in the employment of the services of a single superintendent. The expense for this supervisory work is borne jointly by the municipalities and the State.

charitable and Penal Institutions.—The following is a list of the State institutions coming within this classification: Augusta State Hospital, Augusta; Bangor State Hospital, Augusta; Bangor State Hospital, Bangor; Pownal State School, Pownal; Central Maine Sanatorium, Fairfield; Northern Maine Sanatorium, Presque Isle; Western Maine Sanatorium, Hebron; Maine State Prison, Thomaston, State Reformatory for Women, Skowhegan; State Reformatory for Girls, Hallowell; State School for Girls, Hallowell; State School for Boys, South Portland; Maine School for the Deaf, Portland; and State Military and Naval Children's Home, Bath. In addition to the State institutions, there are hospitals at Portland, Augusta, Lewiston, and other cities.

History.—Maine is supposed to have been visited by the earliest explorers: Corte-Real in 1501 and Verrazano in 1524 reported a coast, the description of which corresponds with that of Maine. Gomez in 1525 sailed along the coast and named the Penobscot River, Rio de las Gamas, or Stag River. Sir John Hawkins, the famous Elizabethan seaman, explored the coast in 1565, and Sir Humphrey Gilbert in the voyage which cost his life was on his way to the Penobscot region, then known as Norumbega, to settle a colony under a patent from Elizabeth. Bartholomew Gosnold, an Englishman (one of the founders of Jamestown, Va.), explored the coast in 1602, and Maine was visited by Martin Pring, in 1603, by De Monts in 1604 and by Weymouth in 1605. The first attempt to settle on the territory was made by the French under De Monts, who, having received a patent from the French king, planted a small colony on Neutral Island in the Saint Croix River in 1604. The first colony settlement attempted by the English was at the mouth of the Sagadahoc by George Popham and Raleigh Gilbert in 1607. A fort was erected and a number of buildings and here the Virginia, the first vessel built in the country, was launched and subsequently formed one of the fleet of the Somers and Gates Colony in 1609. The colony at Sagadahoc was broken up by the death of Popham and great hardships endured by the colonists. They returned to England in the autumn of 1608. In 1613 French Jesuits established a mission on Mount Desert Island, but they were expelled by the English the next

year. In 1614 the coast was visited by John Smith, who found a few scattered settlers around Pemaquid Bay and on the island of Monhegan, off the coast of that part of the State now included in Lincoln County In 1616 Sir Ferdinando Gorges, "The father of American Colonization," who had sent Pring and Popham to Maine, sent his agent, Richard Vines, to Saco to remain during the winter to explore the country and test the climate. In 1620 the king of Great Britain made a division of the grand charter of 1606 and granted to the Plymouth Company in England the whole country lying between 40° and 48° N, and to the Virginia Company the southern portion of the original patent. On 10 Aug 1622, Gorges received a patent of territory between the Merrimac and Kennebec rivers, and the next year sent his son Robert as governor and lieutenantgeneral of the country, accompanied by several councillors and a minister of the Church of England to establish worship. In 1629 another division of lands was made giving to Sir Ferdinando Gorges the country between the Piscataqua and Kennebec rivers, to which he Piscataqua and Kennebec rivers, to which he gave the name of New Somersetshire, and the remainder to John Mason The first court in the province was convened by William Gorges, nephew of Sir Ferdinando, at Saco, 21 March 1636 Charles I granted to Gorges in 1639 a charter under which in 1641 Gorges established the first chartered city in the United States, under the name of Gorgeana, and constituted it the capital of the province. What was then Gorgeana is now York. Its original name was Agamenticus. A fort was built here and efforts made to protect the people against the Indians. From 1630 to 1632 settlements were commenced in Saco, Biddeford, Scarboro, Cape Elizabeth and Portland, all of which continued to prosper till the Indian War of 1675, when to prosper till the Indian War of 1675, when they were overthrown. Massachusetts claimed a portion at least of the territory of Maine on the ground that its charter included the lands as far north as three miles above the source of the Merrimac; but those to whom other charters had been given resented her interference. In 1677 Massachusetts purchased from the In 1677 Massachusetts purchased from the heirs of Gorges all their interest in the province of Maine. A new charter, issued by William and Mary, in 1691, combined the provinces of Massachusetts, Plymouth, Acadia, Maine and Sagadahoc into one province, called "The Royal Province of Massachusetts Bay." Maine was now a part of Massachusetts. Remote from the centre of white settlements of any great size, Maine suffered from attacks by Indians, espe-cially during the French and Indian wars. When King Philip's War was ended there were within its boundaries only five settlements.

Among the first soldiers in active service in the Revolutionary War were men from Maine, who fought as Massachusetts troops. A regiment from Maine was present at Bunker Hill. The British fleet, in 1775, attacked and destroyed Portland and Falmouth. Off Machias was fought the battle in which the Margaretta, a British ship, was captured. At the close of the war Massachusetts still retained possession of the country and called it the "District of Maine." The people of Maine were divided in their allegiance to Massachusetts; one party desired to remain a part of the "Bay State" and another party wanted independent statehood.

The separatist movement gained ground during the War of 1812. Maine was admitted into the Union as a State 15 March 1820.

The northeastern boundary continued a source of dissension with Great Britain, or between the people of Maine and New Brunswick until after the ratification of the Ashburton Treaty (q v), which practically settled the eastern boundary between the United States and Canada

The legislation of the State has been usually marked by conservatism and sound judgment. In 1851 Maine adopted a prohibitory liquor law which was afterward embodied in the constitution of the State During the Civil War Maine furnished 70,107 soldiers, of whom 9,398 died during the war and a large number returned to their homes disabled invalids.

The State went Democratic at State elec-

The State went Democratic at State elections (except 1840) till 1855, when Anson P. Morrill was elected governor as the candidate of the "Know-Nothing" party and also of those who favored a prohibitory law. From 1856 to 1910 the State has gone Republican except in 1878 and 1880, when the Democrats and Greenbacks on a fusion ticket elected their candidates. In 1879 a dispute anose as to the legality of the election of some of the members of the legislature and of the governor For a time a disturbance was feared, but the militia preserved peace until the Supreme Judicial Court rendered a decision making the Republican candidates legal members of the legislature. This State has had no serious internal troubles except the "Know-Nothing" agitation in 1854-56, and the dispute about the legislature in 1879. In 1910, 1914 and 1933 the State went Democratic. In 1916, 1920, 1924, 1928, 1932, 1936 and 1940 it voted Republican.

Since Maine became a State there have been over 50 different governors, some of whom have held the office for more than one term.

LIST OF GOVERNORS.

William King .	Democrat	1820-21
William D Williamson		
(acting)*	«	1821
Benjamin Ames (acting)*	a	1821
Albion K Parris.	a	1822-27
Enoch Lincoln .	a	1827-29
Joshua Hall (acting)† Nathan Cutler (acting)†	a	1829-30
Nathan Cutler (acting) t	ø	1829-30
Ionathan G Hunton.	a	1830-31
Samuel E Smith	a	1831-34
Robert P Dunlap	<i>«</i>	1834-38
Edward Kent	Whig	1838-39
John Fairfield	Democrat	1839-40
Edward Kent	Whig	1840-41
T 1 73 C 11		1841-43
John Fairheid	Democrat	1843-44
Hugh J Anderson		1844-47
John W. Dana		1847-50
John W. Dana	4	1850-53
William G Crosby	Whig and Free-Soil .	1853-55
Anson P Morrill		1855-56
	Democrat	1856-57
Hannibal Hamlin	Republican	1857
Joseph H Williams (acting) Lot M. Morrill	<u> </u>	1857-58
Lot M. Morrill	a	1858-60
Isaac Washburn, Jr	a	1861-63
Abner Coburn		1863-64
Samuel Conv	a	1864-67
Joshua L Chamberlain	a	1867-71
Sidney Perham	<i>a</i>	1871-74
Nelson Dingley, Ir.	<i>a</i>	1874-76
Selden Connor	a	1876-79
Alonzo Garcelon	Democrat-Greenback	1879-80
Daniel F. Davis	Republican	1880-81
Daniel F. Davis Harris M. Plaisted.	Democrat-Greenback	1.881-83
Frederick Robie Joseph R. Bodwell	Republican	1883-87
Joseph R. Bodwell		1887
Sebastian S. Marble (act-		
ing)	•	1887-89

Edwin C. Burleigh. Republican. Henry B Cleaves " Llewellyn Powers " John F. Hill "	1889-93 1893-97 1897-1901 1901-05
William T. Cobb	1905-09
Bert M Fernald	1909-11
Frederick W Plaisted Democrat	1911-13
William T Haines . Republican	1913-15
Oakley C Curtis Democrat	1915-17
Carl E Millifran Republican	1917-21
Frederick H. Parkhurst. " Died Jan.	1921
Percival P. Baxter	1921-25
Ralph O. Brewster	1925-29
William T. Gardiner. "	
William 1. Galdinel	1929-33
Louis J Brann Democrat	1933-37
Lewis O. Barrows Republican	1937-41
Lewis O. Barrows Republican Sumner Sewall	1941–
†Cutler and Joshua Hall, acting.	

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JAMES PHINNEY BAXTER.

MAINE, France, an old province having Normandy on the north, Brittany on the west and Anjou and Touraine on the south and Orléannais on the east. It corresponded to the modern departments of Sarthe and Mayenne. The ancient capital was Le Mans.

MAINE, The. A battleship of the United States navy, mysteriously destroyed by explosion in Havana Harbor, Cuba, on the night of 15 Feb 1898. The revolt of the Cubans in 1895 against Spanish misrule had brought the island in 1897-98 to the verge of ruin. General Weyler had been recalled and General Blanco was sent as governor-general to endeavor to bring order out of chaos, but his plans failed and January 1898 witnessed serious disturbances The American government, believing the lives and property of American citizens in Havana in danger, the Maine, which had been for some time at Key West, was ordered to Havana and arrived at that port 24 Jan 1898. She was piloted into the harbor by an official pilot of the Spanish government and was moored to a government buoy. The usual official and international calls and salutations were exchanged between the Spanish authorities and the commander of the *Maine*, Capt. Charles D Sigsbee, and outwardly there was no evidence of the impending disaster. The *Maine* carried 26 officers and 328 men, all of whom were on board when the explosion took place, except an assistant engineer, two naval cadets and a gunner. Two officers and 250 men were killed at once and 8 men died afterward in hospital. Only 16 of the crew wholly escaped injury. Of the dead, 166 were buried in Colon Cemetery, and 25 at Key West. In 1899 the dead buried at Colon Cemetery were brought to the United States and buried at Arlington with military and naval ceremonies. A court of inquiry, Capt W T. Sampson presiding, was instituted and after a month's investigation expressed the opinion that the vessel was destroyed by the explosion of a submarine mine, but responsibility could not be fixed upon any person or persons Shortly afterward war was declared. (See United States — the War with Spain).

There was a very general demand throughout the United States that the Maine should be raised, and on 9 May 1910 Congress authorized operations and the matter was placed in charge of the War Department, and assigned specifically to the engineer corps of the army. An elliptical coffer-dam, composed of a series of huge contracted cylinders that were constructed of interlocking steel piles and filled with mud and stone, was placed around the wreck. It was a wonderful piece of engineering, re-flecting great credit on every army engineer connected with its inception and execution. The coffer-dam was completed 5 June 1911, and the entire wreck exposed 2 November following A joint army and navy board, of which Rear-Admiral Charles E. Vreeland was president, was then sent to Havana to reinvestigate the wreck. It reported 15 Dec. 1911, confirming the verdict of the Sampson court except in the non-essential detail that the centre of the explosion was a little farther aft than was reported by that court. The after half of the hull, all that was not shattered, was floated 13 Feb 1912, 14 years, lacking two days, after the Maine's destruction. On 16 March 1912 this relic of the once powerful battleship was towed to sea, with attendant ceremonies, afloat and ashore, and sunk in 600 fathoms of water. Concurrently 34 coffins, estimated to contain the bones of 64 of the Maine's dead, were placed on board an American war vessel and dispatched to Arlington, where, on 23 March, they were buried in the Maine plot.

MAINE, University of, The, a co-educational institution, situated at Orono, Me., about nine miles northeast of Bangor. The campus of more than 200 acres borders a branch of the Penobscot River. A part of the public edu-cational system of the State, the university is a land-grant college, originally established as the State College of Agriculture and the Mechanic Arts under the provisions of the Morrill Act of 1862. The institution opened in 1868. The original name was changed to the «University of Maine» in 1897.

The average number of students enrolled is approximately 1,800. Instruction is offered in 33 departments. The university includes the Colleges of Arts and Sciences, Agriculture, Technology, and School of Education. The Maine Agricultural Experiment Station was established as a division of the university in 1887. Graduate instruction is given in various departments and since 1923 graduate work has been a separate division in charge of a dean. A College of Law was opened in 1898 and discontinued in 1920. About 135 courses in 19 departments are offered in the Summer School. Extension work in agriculture and home economics is carried on throughout the State, co-operatively with the United States Department of Agriculture. A limited number of extension courses in other fields are conducted. To provide permanently for the support of the university the State legislature in 1929 passed an act levying a tax of one mill on the general property valuation of the State. The degree of B A, with specification of the major subject, is conferred upon students completing a curriculum in the College of Arts and Sciences. The degree of B S. is conferred upon comple-The degree of B.S. is conferred upon completion, in accordance with requirements, of four years' work in the Colleges of Agriculture and Technology. In the School of Education, the following degrees are awarded B.A. in Ed., B.S. in Ed., B.S. in Commercial Education, and B.S. in Fine Arts Education The degrees of M.A., M.S., M.A. in Ed., and M.S. in Ed. are granted for one year's graduate work completed. granted for one year's graduate work completed with distinction.

Fifteen fraternities and five sororities have chapters at the university. The fraternities maintain houses of their own. Other men live in university dormitories and private homes. Women live in dormitories, two of which are operated co-operatively, thereby substantially reducing these students' expenses for room and

Seven national honorary societies have chapters at Maine. One of them, Phi Kappa Phi, was founded at the University of Maine in

> ARTHUR A. HAUCK, President.

MAINE BOUNDARY TREATY. The year 1910 witnessed the final settlement of the long-standing dispute as to the boundary line between Maine and New Brunswick. Secretary of State Knox, acting for the United States, and Ambassador Bryce, on behalf of Great Britain, signed a treaty which establishes the exact boundary of Maine for all time. At the close of the Revolutionary War in

1783 the first attempt was made to fix a satisfactory boundary, but it resulted only in hopeless dissatisfaction. Ever since that time the matter has remained one for ceaseless wrangling and dispute. Scarcely a diplomat has been sent to this country from England but has been called upon to familiarize himself with the Maine-New Brunswick boundary situation; while the State Department of this country has gone over the ground so many times that that performance had almost come to be regarded as one of the regular duties of the department.

Most boundary lines are fixed by nature; those which are not do not as a rule amount to a great deal, and an amicable settlement can usually be reached at once. With the Maine-New Brunswick line, however, neither of these conditions have ever applied, particularly in that part which has so long been in dispute. This particular line runs through Passama-quoddy Bay, along the little islands at the mouth of the Saint Croix River. As a result of its indefinite character there has been endless dispute and strife among the fishermen who frequent these parts; dispute which had had an industrial significance since both the Eastport and Lubec canneries have sent their men to this point, and it makes a vast deal of difference whether they are fishing in American or Canadian waters.

The source of all the trouble was the looseness with which the first treaty, that of 1783, was drawn up. Article II of that document reads: "And that all disputes which might arise in future on the subject of the boundaries of the said United States may be prevented, it is herein agreed and declared that the following are, and shall be, their boundaries, viz.: From the northwest angle of Nova Scotia, viz: That angle which is formed by a line drawn due north from the source of the St Croix River to the Highlands; along the said Highlands which divide those rivers that empty themselves into the river St Lawrence from these which fall into the Atlantic Ocean, to the northwestermost

head of the Connecticut River," etc.

Thus, while the Saint Croix was plainly named as the beginning of the eastern boundary, the only point mentioned was the source of the river, and not a word was said about its mouth or the numerous islands of the great bay into which it empties. Moreover, there arose at once the questions as to what was the Saint Croix River. The trouble loomed up at the very start. The first action toward a settlement was taken in 1794 when John Jay was charged to adjust the matter All he was able to accomplish, however, was a provision in his treaty of that year for the appointment of three commissioners to determine just what was the Saint Croix River. These commissioners met at Halifax in 1798 and determined the river, but neglected to mention its source and made no disposition of the islands at its mouth Subsequently there were treaties, conventions and declarations between the United States and Great Britain relative to this subject in 1814, 1818, 1827, 1842, 1846 and in 1870, but in every instance there was something still left to be adjusted around the mouth of the river.

The Treaty of Ghent in 1814 provided for commissioners to settle the matter and they decided that Moose, Dudley and Frederick islands belonged to the United States, while all the other islands, including Grand Menan, were the property of Great Britain. This was very good so far as it went, but it left unsettled the status of several small islands in the Saint Croix and of the line itself through the bay. The channel thus remained in dispute.

In addition to this, trouble soon arose over the boundary line northward and westward from the source of the Saint Croix. The original treaty had been exceedingly vague on this subject, and finally in 1827 the king of the Netherlands was named as referee to conclude the dispute. After failing for a long time to satisfy either party with any of his suggestions, he drew a line to suit himself, awarding part of the disputed territory to Maine and part to New Brunswick. The United States rejected this arrangement, while in the meantime the disturbances on the border kept becoming more and more serious. Operations of the 1830 census takers in the contested area created much feeling, and eight years later an American lumber dealer was thrown into jail by New Brunswick officials - the act having much to do with the precipitation of the Aroostook war. Although no blood was spilled in this it came wery near to maturing into a third war with England. A joint occupation was agreed upon as a temporary compromise, before Daniel Webster and Lord Ashburton came together in 1842 and drew up the famous treaty which settled all dispute as to that particular part of the

boundary line.

It has been related as an historical fact that in these negotiations both nations withheld maps which were unfavorable to their claims. The Americans had one which had been discovered but a short time before in Paris, and was supposed to have been drawn up by Benjamin Franklin, while in the possession of the English was one made by Richard Oswald, who was one of the commissioners who negotiated in the treaty which gave the United States its independence. Later both nations showed these maps to their own people in evidence of how conclusively they had got the best of the bargain. Up to the present time, however, the United States has always regarded the signing of this treaty of 1842 as a diplomatic triumph.

The treaty of 1842, however, made no men-

The treaty of 1842, however, made no mention of any part of the boundary south of the monument which had been erected at the source of the Saint Croix, and until Secretary Knox and Ambassador Bryce signed their treaty of 1910 the lower part of the line in places was still contested. But with the signing of this latest treaty and the final settlement of the whole chaotic matter no point now remains between the United States and Canada which

is in the slightest dispute

MAINS. See ELECTRICAL TERMS.

MAINTENANCE, in its legal signification, the interference by a person in litigation in which he is not primarily interested, by assisting either party with money or otherwise. It includes champerty (qv), which consists of maintenance for reward or for a share in the proceeds of the litigation promoted. An agreement of this kind is illegal and void and at common law is punishable as an offense tending to obstruct justice. To-day where the common law prevails the wrongful intention with which the assistance is given is regarded as the gist of the offense. In many jurisdictions maintenance is no longer recognized as a criminal offense and in many States is not regarded as a civil cause of action by the injured party against a maintainor of the suit against him See CRIMINAL LAW and consult the authorities referred to under that title.

MAINTENON, măń-të-nôn, Françoise d'Aubigné, Marchioness de, French queen b. Niort, Poitou, 1635; d Saint-Cyr, 1719 Her birthplace was the prison in which her parents were confined because of religious trouble. After her father's death in her 10th year she became the ward of her guardian and aunt, Madame de Neuillant, who gave her a some-what limited education and through whose efforts she became converted to the Catholic faith at about the age of 14. She was then returned to her mother, whose income was insufficient for the child's support. Her humiliation did not embitter her bright and cheerful disposition, however, and when at 16 the famous wit and man of letters, Scarron, deformed, old and infirm as he was, became her husband, and she was soon the centre of the clever literary people who frequented his house. When Scarron died, her good sense and delightful disposition recommended her to many friends, who pointed her out to Louis XIV as a fitting person to take charge of the education of the children born to him by Madame de Montespan. She undertook the office of governess to the royal children, won their affection and respect as well as that of the king, who married her in 1685 when she was 50 and he 47. There can be no doubt that she exercised a beneficent influence over the king's private life. She was undoubtedly disinterested and charitable, her character above stain in a profligate age, and her mind clear and resolute in pursuing the course she thought to be right. She survived the king four years and died at the nunnery at Saint Cyr which she had changed into a place of education for the poor daughters of families, having enjoyed to the end all the honor and position of a royal widow Consult Blennerhassett, C J, 'Louis XIV and Madame de Maintenon' (New York 1911); Dyson, C. C, 'Madame de Maintenon Her Life and Times, 1635-1719' (London 1910), Geffroy, 'Mme de Maintenon d'après sa correspondence authentique' (Paris 1887); Noailles, 'Histoire de Mme. de Maintenon' (ib 1848-58); Pilastre, E, 'Vie et caractère de Mme. de Maintenon' (ib 1907).

MAINZ, mints, Germany, a town in the state of Hesse-Darmstadt, on the left bank of the Rhine, opposite the mouth of the Main, 20 miles by rail southwest of Frankfort. It was a fortress of the first rank and is an episcopal see and a river port The town rises gradually from the Rhine in the form of an amphitheatre A railway bridge spans the Rhine a little above its junction with the Main, and a stone bridge connects with the opposite suburb of Kastel. A handsome quay, 330 feet wide, extends along the Rhine for a considerable distance, and large modern harbors have been constructed The principal edifices are the cathedral, recently restored, a vast building of the 11th century; the former electoral palace, now containing the city library (230,000 vols.), picture gallery, museum of Roman and Roman-German antiquities, etc., the old collegiate church of Saint Stephen, occupying the highest site in the town, the church of Saint Peter, the German House, or grand-ducal palace with the arsenal adjoining, the courts of justice, the government buildings, public hall, two new concert halls, central railway station, etc. One of the most interesting objects in the town is the house of Gutenberg which contained his first printing office. A bronze statue of Gutenberg, by Thorwaldsen, stands in an open space near the theatre. The great open-air resort is the Neue Anlage, outside the gates, consisting of extensive public gardens, and commanding fine views of the town and surrounding district. The manufac-tures consist chiefly of leather, furniture, hardware, carriages, carpets, tobacco, beer, chemicals, musical instruments, gold and silver wares, machinery, soap, hats, etc. The trade, particularly transit, is extensive. The principal articles are Rhenish wine, corn, flour, oil, coal and wood. Mainz owes its foundation to a Roman camp which Drusus pitched here On the decline of the Roman power it was almost entirely destroyed, but was afterward rebuilt chiefly by Charlemagne, and became the first ecclesiastical city of the German Empire, of which its archbishop-elector ranked as the premier prince. Pop. (1933) 142,627.

MAIPO, mi poo, or MAIPU, a river in Chile, having its rise in the Andes Mountains and flowing almost due west into the Pacific Ocean. It is 120 miles in length The falls and rapids furnish valuable water power, which has not been utilized to any great extent. The city of Santiago is a few miles north of the river. On 5 April 1818 was fought on the banks of the Maipo the battle which decided the independence of Chile

MAIR, mār, Charles, Canadian writer: b. Lanark, Ontario, 21 Sept. 1840; d 1906. He was educated at Queen's University, Kingston, and entered journalism. He aided in quelling the Riel insurrections and was one of the organizers of the "Canada First" party. Among his works are 'Dreamland and Other Poems' (1868); 'Tecumseh,' a drama (1886).

MAISON CARRÉE, mā-zon' ka'rā, Roman temple at Nimes, France, the most perfect of its type remaining It was probably built early in the Christian era, its inscription dedicating it to the adopted sons of Augustus, Gaius and Lucius Cæsar, although by some authorities its date is placed at about the 2d century. It is built on the plan of the Parthenon although its dimensions are smaller. It stands on a podium 11 feet high, measures 40×82 feet and is entered by a flight of 15 steps. There are 30 columns, of which 20 are in the side and rear walls while 10 form the portico. The temple now houses collections of antique sculpture and coins.

MAISONNEUVE, mā-zön-nev, Paul de Chomedey, Sieur de, French colonizer: b. Champagne, France; d. Paris, 9 Sept. 1676. He enlisted in the French army at 13 and later organized a band of colonists with whom he landed at Quebec in 1641. In 1642 he founded Montreal and was for 22 years its governor but was absent for a time in 1652 when he returned to France to conduct to America a new party of settlers. He displayed great administrative ability, but through the jealousy of De Mésy, governor-general of Canada, was in 1664 recalled to France by De Tracy. Though no charges were made against him he found no possibility of reinstatement in office and resigned in 1669.

MAISTRE, ma'tr, Joseph Marie, Comte DE, French philosopher and savant: b. Chambéry, 1 April 1754; d Turin, 26 Feb. 1821. He was of French extraction and was a senator of Piedmont at the time of the French invasion (1792). He left his country in consequence of that event, and afterward followed his king to Sardinia. In 1803 he was sent Ambassador to Saint Petersburg, and returned finally to Turin in 1817. De Maistre was familiar both with Greek and Latin literature, and his writings in French have obtained the highest praise of critics. He was a conservative in politics, religion and philosophy, a supporter of absolute monarchy and of the infallibility of the Pope, His 'Mémoires politiques et correspondance diplomatique' (published posthumously, 1858), however, shows him in the light of a much more discerning and less uncompromising politician than his formal treatises, and indicates a large and liberal appreciation of the revolution which he opposed. As a diplomatist he exerted himself to effect the restoration of all

his former possessions to his master, and to obtain the transfer of Genoa. Among his political writings are his 'Eloge de Victor Amadée III'; 'Considérations sur la France' (1796); 'Essai sur le principe générateur des constitutions politique' (1810), in which he maintains the divine origin of sovereignty; 'Du Pape' (1819); 'Soirés de Saint Petersborg' (1821; new ed, 1888); 'De l'Eglise gallicane' (1821-22); and 'Du Congrès de Rastadt' (the last with the Abbé de Padt). 'Quatre chapitres inédits sur la Russie par le comte Joseph de Maistre' was published by his son in 1859 Consult Descostes, 'Joseph de Maistre avant la révolution' (Paris 1893); Lescure, 'Joseph de Maistre et sa famille' (1b 1893); Paulhan, F., 'Joseph de Maistre et sa philosophie' (1893)

MAISTRE, Xavier DE, French soldier, essayist and novelist, brother of Joseph de Maistre (qv): b. Chambéry, October 1763, d. Petrograd, 12 June 1852. He served in the Piedmontese army when very young, and his literary career began with his writing, 'Voyage autour de ma chambre' ('Journey Around My Room,' 1794), while in prison at Turin for participation in a duel When Savoy was annexed to France he went to Russia and there secured a commission in the army, where he rose to the rank of major-general. He lived for a time in Naples after the restoration of the Piedmontese dynasty, but eventually returned to his adopted country and died there His style was graceful and his work was marked by strong delineation of character and exceptional descriptive power (See Journey Around My Room). He also wrote 'Le Lépreux de la cité d'Aoste' (1811); 'Les prisonniers du Caucase' (1815); 'La Jeune Siberienne' (1815); 'Expédition nocturne' (1825) His complete works were published in three volumes (Paris 1825).

MAISUR, mī-soor'. See Mysore.

MAITIN, mi'tăn, José Antonio, Venezuelan poet b. Porto Cabello, 1798 d. Choroni, Venezuela, 1874 In 1824 he returned from Havana to his own country whence he had fled on account of persecution, and made his home in the valley of Choroni. In 1844 his best poems were collected and published with the title 'Echoes from Choroni,' and in 1851 a collected edition of all his works appeared

MAITLAND, Edward, English mystic and writer: b Ipswich, 27 Oct 1824; d Tonbridge, 2 Oct. 1897. He was educated at Caius College, Cambridge, and was destined for the ministry, but declined to take holy orders because of his incompatible religious beliefs. He was one of the "Forty-niners" in California and later went to Australia where he became a commissioner of Crown lands. He was married and widowed in Australia and in 1857 returned to England where he engaged in literary work of an humanitarian order. He made the acquaintance of Mrs. Anna Kingsford in 1874 and with her crusaded against materialism, vivisection and the use of animal food. In 1876 he announced that he had acquired a new sense which enabled him to see the condition of peoples' souls, as well as those of trees and animals, and likewise revived his memory of his own previous incarnations. He joined the Theosophical Society in 1883, but shortly afterward withdrew from

it and with Mrs. Kingsford founded the Hermetic Society which was of mystic rather than occult character. After the death of Mrs Kingsford in 1888 he maintained that they remained in communication. In 1891 he founded the Esoteric Christian Union He wrote for the Spectator and the Examiner, reviewed books for the Athenæum, and collaborated with Mrs Kingsford in writing 'The Key of the Creeds' (1875), and 'The Perfect Way, or the Finding of Christ' (1882). Author of 'The Pilgrim and the Shrine' (1867); 'The Higher Law' (1869); 'By and By' an Historical Romance of the Future' (1873); 'Clothed with the Sun. Being the Book of the Illuminations of Anna (Bonus) Kingsford' (1889); 'The New Gospel of Interpretation' (1892); 'Anna Kingsford, Her Life, Letters, Diary and Work, By her Collaborator, with a Supplement of Post-Mortem Communications' (2 vols, 1896). After the completion of the 'Life' of Mrs. Kingsford, which, like most of his writings, was largely autobiographical, his mental powers failed rapidly

MAITLAND, Frederic William, English historian: b London, 28 May 1850, d. 19 Dec. 1906. He was graduated from Trinity College, Cambridge, and studied law; in 1884 was made reader of English law at Cambridge and from 1888 was professor of the same branch there He read widely on legal history, founded the Selden Society in 1887 for the study of the history of English law and was a generally recognized authority. Among his works are 'Gloucester Pleas' (1884); 'History of English Law,' with F Pollock (1895); 'Canon Law in England' (1898); 'English Law and the Renaissance' (1901), etc.

MAITLAND, J. A. Fuller. See Fuller-Maitland, J. A.

MAITLAND, SIR Peregrine, British soldier b Hampshire, England, 1777; d. London, 30 May 1854. He enlisted in the army in 1792 and was promoted rapidly, serving in Spain and at the battle of Waterloo, where he was a major-general. In 1818 he was appointed lieutenant-governor of Upper Canada and in 1828-34 was governor of Nova Scotia. He was made lieutenant-general in 1830 and commanded the Madras army, 1836-38. From 1843-47 he was governor and commander-in-chief at the Cape of Good Hope.

MAITLAND, SIR Richard, LORD LETHINGTON, Scottish poet and antiquary: b. Scotland, 1496; d Edinburgh, 20 March 1586 He was educated at Saint Andrews and was one of the great lawyers of his day, and although he became blind in 1561 was nevertheless made a member of the Privy Council, and in 1562 keeper of the great seal His manuscript collection of early Scottish poetry is preserved at Magdalene College, Cambridge. A selection from his collection, together with his own poems, was published in 1786, and his poems were reprinted in 1830 by the Maitland Club, a literary organization founded in his honor in Glasgow in 1828.

MAITLAND, William, Scottish statesman: b. Scotland, about 1528; d Leith, 9 June 1573. He was a son of Sir Richard Maitland, Lord Lethington (q.v.), and was educated at Saint Andrews and on the Continent. He early entered political life and was interested in the Knox reform movement; in 1558 he was appointed Secretary of State by Mary of Guise, and is commonly called "Secretary Lethington." He was one of the commissioners who concluded the Treaty of Berwick and in 1560 was speaker of the Scottish Parliament He was one of Mary's ministers on her return from France, but was suspected of having betrayed her to Queen Elizabeth. In 1563 Maitland conducted a prosecution for treason against Knox whom he had earlier supported, and in 1565 he became lord of the sessions but was removed from office for implication in Rizzio's murder; he was also connected with the murder of Darnley. He contrived Mary's escape from Lochleven but fought against her at Langside. After the assassination of Moray he became the leader of the queen's party and was active in her support. He joined Kirkcaldy at Edinburgh Castle, and encouraged him to hold out until the last. He was taken prisoner at its surrender and died in prison. Consult Skelton, 'Maitland of Lethington and the Scotland of Mary Stuart' (1887–88).

MAITLAND, Australia, town, in North-umberland County, in New South Wales, on the Hunter River, about 119 miles north of Sydney by rail. It is connected by railroad with Newcastle, about 15 miles distant. The Hunter River divides the town into East and West Maitland, two distinct municipalities, West Maitland being the larger. The Hunter River frequently overflows its banks and floods the town and surrounding country. Although serious devastation results, the soil has been enriched by this flooding, and so fertile is this section that Maitland is called the "garden of New South Wales." Grapes, grains, tobacco and vegetables grow in abundance. Large coal fields are near the town Considerable manufacturing is carried on, especially in West Maitland. Pop. of East and West Maitland, 12,000.

MAIZE. See CORN, INDIAN.

MAIZEROY, René, BARON (real name René Jules Jean Toussaint), French novelist: b. Metz, 2 May 1856 He was educated at the Jesuit College of Saint Clement, the Toulouse Lycée and the Saint Cyr Military School, becoming second lieutenant in the 53d regiment of Infantry. He resigned from the army in 1881 and entered upon a literary career. He contributed to Le Gaulois, Figaro, Gil Blas, La Vie Moderne and Clarion, and became a voluminous writer of fiction, also producing several pantomimes, ballets and dramas. Author of 'Le Capitaine Bric-a-brac' (1880); 'Souvenirs d'un officier' (1888); 'L'Adorée'; 'P'ti'-Mi'; 'Le Reflet'; 'En Volupté'; 'Glorita, fille et marquise'; 'Yetto, mannequin'; 'Ville d'Amour'; 'La Mer' (1895); 'La Remplaçante' (1906); 'L'Amour en danger' (1912), etc. He died in 1918.

MAJESTY (Latin, majestas). Majestas, in a collective sense, was used in republican Rome to signify the highest power and dignity, the attribute of the whole community of citizens, the populus. The majestas was also ascribed to the dictator, consul, and even Senate, though in the case of the last the word auctoritas was used in preference. At a later period,

under the Roman emperors, majestas was the name of the imperial dignity, whilst that of a magistrate was called dignitas. To kings the attribute of majesty was given much later. The courtiers introduced the title into France under Henry II. In the Treaty of Crespy (1544) Charles V is styled imperial, Francis I royal majesty; and in the Peace of Câteau-Cambrésis (1559) the titles of most Christian and Catholic majesty are found for the first time. In England Henry VIII first adopted the title majesty, grace and highness being the titles formerly employed. At present this title is given to all European emperors and kings.

MAJOLICA AND MEZZA-MAJOLICA. Spelled also maiolica. It is generally claimed that the word was derived from the island of Majorca, whence the first pieces of this ceramic ware were imported to Italy. The term ware were imported to Italy. majolica has become a very confused and indefinite expression and used by writers with different meaning. The term, in its first application, referred only to the early Italian lustre-ware made (15th century) with transparent silicious glaze and outer surface of metallic sheen in imitation of the lustre-ware metallic sheen in imitation of the lustre-ware Hispano-Moresque creation Later, the early enamel-covered and color-decorated wares of Italy were called majolica regardless of metallic lustre surface, and the lustre-ware having Oriental style of form and decorative treatment was termed messa-majolica. But the term majolica has in modern times been vulgarized into a broader definition by the public including practically everything in ceramics having glaze coating and painted decoration Leading experts retain the more distinctive terms. Lustre decoration consists of imparting a metallic or pearl-like (nacreous) sheen to the outer surface of the ceramic ware by coating over the already decorated and fired piece with a thin layer of a pigment containing either gold, silver, copper, etc., and then firing under moderate heat. The effects are very delicate and beautiful and are known, according to the different sheens produced, as ruby (rubino), gold, silver, mother-of-pearl (madreperla), etc.

Mezza-Majolica.— The earliest production of this ware was in Persia and Turkey, but it is only in quite recent years that the actual fabriques have been located. To this Turkish ware belong the pieces heretofore labeled "Lindos" and "Rhodesian" ware from the location of the sites where examples had been excavated. The actual sites of production now satisfactorily proven and dates of discovery of these prototypes of mezza-majolica are as follows: Rekka (1896), Sultanabad (1905), Sultanabad (1905), The ware formerly Rhages, quite recently. The ware formerly termed "Siculo-Arabian" is now said to have had its home in Syria or Egypt, and the so-called "Rhodesian" ware in Osmanli-Turkey. The latter has most brilliant coloring (blue, grayish-black, green, etc., and, later, red) and ornamentation as well as most masterly technique in execution. At Fostat, in Lower Egypt, lustred and unlustred ware was produced before the 12th century. We find among the Persian examples cylindrical vases, pearshaped bottles, plates, tiles, bowls, mosque lamps, etc. In the Persian polychrome enameldecorated ware of the 17th century we find dark

blue, yellow, green, purple, red, black, turquoise, all on very white ground, with typical Persian decoration (arabesques, flowers, turbaned Such 17th and 18th cenheads, figures, etc) tury ware was produced in northeast Persia, Bokhara, Kirman, Kashan, etc. Practically all this ware had its body coated (engobe) The Mohammedan tiles (known in Arabic as rojolos) were very beautiful and utilized in covering outside spaces of the mosques as well as the internal wells Grand effects are those presented in the Blue Mosque, at Tabrız (15th century) and at Khoda Bende Khan shrine at Sultanieh (14th century), etc. Spain produced glazed ware as early as the 8th century (mosque of Cordova has examples). Through its Moorish artists Spain produced lustre-ware, an industry doubtless derived from Oriental sources, at an early date, Calatuyad having both domestic and export trade in the 12th century. This same gold-lustre ware was produced in Malaga during the 14th century, and, by the end of the 15th century, Manises, near Valencia, was the centre for the gold-lustre ware industry, retaining its pottery kilns to the present day. The yellowish tin-glaze on present day The yellowish tin-glaze on Spanish majolica covers both the inside and outside of vessels Color is mostly cobalt blue, but coats-of-arms show a sparse use of brown The great Alhambra vase and and violet. pieces of a similar character belong to the 14th century and were produced in Granada. This Hispano-Moresque art was continued by the Christians after the Moors were expelled, but it soon became decadent in merit. The Spanish colored glazed tiles (azulejos) had the centre of that industry, in the early period, in Seville, but no lustre-ware appears to have been made there In the Spanish decoration predominating motifs were plant life, Arab scripts, figures of animals and concentric circles. The frequent display of heraldic coats-of-arms shows Christian tendency later. The ware consisted mostly of dishes, basins, ewers, vases, apothecary pots (albarellos), etc Talavera, in the 16th to 18th centuries, produced tin-enameled ware pro-lifically. For some time, at least, Paterna, Quarte, Villelonga, Alaqua, Carcer, Moncada, etc., produced gold-lustre ware. The quality of the gold-lustre remained good into the 17th century though other ware became inferior long before. And the modern lustre shows coppery effect instead of the earlier pale gold tones. Alcora produced the best produced ian (Siculo-Arabian) mezza-majolica Alcora produced the best pieces Sicildates back to the 9th century.

Majolica.—Italy imported her lustre-ware from Spain and the island of Majorca, apparently, till about the 15th century, but, by the middle of the 14th century she had started het own mezza-majolica fabriques and by the first half of the 16th century the industry was in its zenith, to become thoroughly decadent by the end of the 16th century. The recent discovery in Faenza of the piece decorated with Astorgio Manfredi (1393-1405) coat-of-arms and the documentary statement of the contemporary writer Pietro del Bono (1330) make it appear that Italy was producing opaque underglaze majolica in the 14th century besides her silicious transparent colored glazes (mexicolor) was being made in Pesaro, Urbino, Gubbio,

Caffagiolo, Treviso, Bassano, Nove, Padua, Candiana, Verona, Milan, Venice, Lodi, Turin, Genoa, Savona, Arbisola, Ferrara, Modena Reggio, Scandiana, Sassuolo, Siena, Pisa, Asciano, Monte Lupo, San Querigo, Castel Durante, Citta di Castello, Bagnolo, Faenza, Forli, Rimini, Ravenna, Bologna, Deruta, Fabriano, Spello, Viterbo, Rome, Capo di Monte, Naples, Grotaglia, Castelli in Abruzzo, Palermo and Catala Girone. Lustre-ware was produced only at Pesaro, Deruta, Gubbio, Urbino and Castel Durante; a few pieces made at Caffagiolo and elsewhere were experimental. The body of old Italian majolica is a buff-colored clay

Gubbio.— This ware is famous for its lustre pieces. Those emanating from the studio (botega) of "Maestro Giorgio" (early loth century) are all elaborately decorated and have a lustre surpassing all other wares. His metallic reflecting surfaces, Solon says, "pass from bluish-purple to ruby-red, from golden-yellow to emerald-green," his madre-perla is absolute perfection. Few Gubbio pieces bear any marks, but besides the before-mentioned Giorgio Andreoli were other Andreolis—Salembini, Giovanni and Vinzentio. The Gubbio fabrique was in decadent condition by 1551. The characteristic decoration of the ware consists of grotesques (groteschi), which the contemporary Picolpasso terms "a candelliere"; they contain artistically executed large scrolls (in yellow or brown) terminating in the heads of sea-horses, monsters, birds, etc., with cherub heads intermingling, trophies with mottoes surround busts. As centre-piece appears a genre or other scene. Human figures show weak drawing.

Urbino.— Under the powerful protection of Duke Guid'Ubaldo II this town took a leading position in the second half of the 16th century with its flourishing majolica fabrique and its remarkably artistic creations. As these pieces were produced for presentation to grandees and even sovereigns perfection of detail and talented elaborate composition were undertaken. So high is the artistic merit of some of the painting that it is claimed to have been from the designs of the great Raphael Limself. Three artists are prominent in this work: Guido Durantino (or Guido Fontana), Francesco Xanto da Rovigo (both of these signed in full), the latter copied, with modifications, engravings after Raphael; and Orazio Fontana (son of Guido), whose drawings are characterized by a light outline in the blue color that was utilized in the flesh tints. The Fontanas did also peculiar grotesque decorations on a white background with very graceful effect, some having medallions of figures as centre-pieces The Patanazzi family (end of the 16th century) were the last of the majolica painters of Urbino. Amongst Urbino motifs were figures, chimera, etc., also we find ornament in relief on salt boxes, inkstands, vases, coffrets, etc., of very decorative form. But the most remarkable production of Urbino was a series of vases designed by Battista Franco, 344 lovely specimens of which are in the Santa Casa de Lorette The general belief in the claim of Vasari that the originator of the opaque tin-glaze in Italy was Luca della Robbia (1399-1482) has been shaken since the discovery of the Manfredi jug (mentioned above). and it is now supposed that

Italian tin-glazed majolica was being produced by the 14th century at least

by the 14th century at least. Mexican Majolica.— Until about 10 years ago the fine specimens of old opaque tin-glazed majolica found in Mexico and sought for by collectors were supposed to be Spanish creations and imported by the colonists. Mrs Robert W. deForest, with her fine collection of this ware (now donated to the New York Metropolitan Museum of Art), was led to take a generous interest in investigating the source of the product. And the late Dr. Atlee Barber of the Pennsylvania Museum, Philadelphia, by his researches disclosed the following facts: About 1526 the Spanish majolica technique was being taught to the colonists by Dominican friars from the Talavera potteries In 1531 Pueblo de los Angeles started a pottery with Spanish artisans and became the centre of a large industry. Mexican-made enamel-glazed tiles were used, instead of the imported articles, to decorate the insides of the walls and also the exteriors of churches, hospitals, convents and even private houses. By 1653, as is shown by documents, the Mexican-made glazed pot-tery was equal to the imported and shipments from Spain were no longer in demand, and a potters' guild was established, to protect the industry in that year. By 1750 there were 30 prosperous potteries making three qualities of wares that they termed "fine, common and yellow" Five colors were used in fine ware, three in common ware. The best period was from 1650 to 1750 Specimens show two kinds of body—the white, soft, porous and the harder-baked red. The process used was that of baking the clay body first, then dipping in the tin enamel engobe and decorating over the enamel. The piece was then subjected to a second firing. The ware has been classified as enamel. The piece was then subjected to a second firing. The ware has been classified as follows: (1) "Hispano-Moresque" phase, up to the end of the 17th century. (2) "Spamsh" or "Talavera" phase, from beginning of the 17th century to about end of the 18th century (showing Talavera influence). (3) "Chinese taste," done by copying pieces of imported Chinese porcelain, started 17th century and continued to end of 18th century. (4) "Hispano-Mexican" or "Puebla" phase, started about 1800 and lasted beyond 1850. Decadence followed, then extinction. The fourth style has green, yellow, purple, brown, red, black and later rose and mauve, in the decoration. Tiles have only three colors, blue, green and yellow, have only three colors, blue, green and yellow, generally. The product consisted of chocolate or vanilla jars, vases, albarelli (drug pots), barrel-shaped flower jars, circular dishes, bowls, saltcellars, inkstands, basins, cup-holders, tiles,

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CLEMENT W. COUMBE.

MA-JONG, or MAH-JONGG, a Chinese game of doubtful origin, which for a time was extremely popular in the United States and Europe. It is played with 144 "tiles," somewhat resembling dominoes. Among the Chinese it is widely used as a gambling game.

MAJOR, Charles (EDWIN CASKODEN), American novelist: b. Indianapolis, Ind, 25 July 1856; d. 1913 He was educated in the public schools and studied law, establishing a practice at Shelbyville. He contributed to various magazines and published 'When Knighthood was in Flower' (1898); 'The Bears of Blue River' (1901); 'Uncle Tom Andy Bill' (1908); 'Dorothy Vernon of Haddon Hall' (1902); 'Yolanda, Maid of Burgundy' (1905); 'Gentle Knight of Old Brandenburg' (1909); 'The Little King' (1910); 'Touchstone of Fortune' (1912).

MAJOR, (1) in music, a term applied to imperfect concords, but chiefly to the interval of the third. It also denotes that one of the two modern modes in which the third is four military science, the major is a field officer ranking next below a lieutenest ranking next below a lieutenant-colonel and above a captain. He has generally the command of a battalion, the exercises of which he superintends, and in action or on parade carries into effects the orders of his superior officer. The term in the French service has been superseded by that of chef de bataillon A brigade major is an officer who performs for a brigade, or in garrison, the duties ordinarily discharged by a major in a regiment or battakon A major-general ranks next above a brigadiergeneral. In other cases, the term major, when applied as an epithet to the several denominations of men in an army, signifies the superior of the department; as sergeant-major, the chief non-commissioned officer in a regiment, who assists the adjutant; drum major, the chief of the drum corps, etc.

MAJORCA, ma-jôr'ka (Spanish Mallorca; Latin, Balearis Major), Spain, an island in the Mediterranean, the largest of the Balearic group; area, 1,330 square miles. It is about 120 miles distant from Spain. It is very irregular in shape, and deeply indented, particularly in the northeast. The scenery is picturesque, the climate mild and agreeable, and in many of the valley regions vegetation is luxuriant. There are quarries of marble of various grades; lead and iron have been obtained, and coal to a considerable amount is mined. The olive and vine are extensively cultivated and there are large orchards of figs and oranges. The principal exports are bricks, lime, plaster, olive oil, light wines, brandy, wool and silk There is a wireless station with a 500-mile range located at Soller, not only for ship and shore traffic, but also for international service. The capital is Palma. Pop. of island, 269,000.

MAJORITY. See Elections; Primary, Direct, Primary, Presidential Preference; Vote, Voters, Voting

MAJUBA (ma-joo'ba) HILL, an eminence in the extreme north of Natal, about 7,000 feet above the sea, the scene of the defeat of 648 British troops, with the loss of their leader, Sir George Colley, by a superior foice of Transvaal Boers, 27 Feb 1881. The attack was unexpected, and the Boers found the British resting after a night march and a climb of eight hours. The loss of the Boers was about 130, of the British more than 200 in killed and prisoners, besides many wounded and some missing. To the British nation the name Majuba Hill became a synonym for disaster. The anniversary of this fight was marked by the success of Lord Roberts, commander of the British forces in the campaign of 1900, when he received the surrender of the Boer commander, General Cronje.

MAKAROV, Stepan Osipovich, Russian vice-admiral: b 1848; d 13 April 1904 He entered the navy in 1864 and received rapid promotion for distinguished services. During the Russo-Turkish War 1877-78, he commanded the gunboat Grand Duke Constantine, and for a series of daringly successful attacks upon Turkish ports, which earned him the title of "the Cossack of the Sea," he was promoted captain of the second rank, aide-de-camp to the late Tsar Alexander II, was decorated with the orders of Saint Vladimir and Saint George and received a golden sword of honor. In 1881 he took part with the legion of Skobeleff in the capture of Geok Tepe in which General Kuropatkin also figured prominently. The same year he commanded the cruiser Taman, the station guardship of the Russian embassy at Constantinople, and made a careful and complete study of the defenses of the Bosporus. In 1882-83 he was chief of staff of the offensive squadron in the Baltic under Admiral Chihachev, Minister of the Navy From 1891 to 1894 he was engaged in improvements of ordnance; among his inventions were the so-called cap guns possessing 20 per cent greater power of penetration into the newest superimposed armor; and the Ermak ice-breaker, the first of the icebreaking vessels now used in Baltic and northern Asiatic waters After the disastrous attack of the Japanese on the Russian fleet at Port Arthur in February 1904 Vice-Admiral Makarov was sent to the Far East to direct the Russian naval operations, and arrived at Dalny 8 March. He repaired and converted the blockaded squadron into an active aggressive naval force, but on 13 April was lured out of harbor by a decoy squadron. Discovering the Jap-anese main fleet trying to intercept him he at once returned and was about to enter the harbor, when his flagship, the Petropavlovsk, was destroyed by one of the sunken mines laid by the Japanese across the passageway, and Vice-Admiral Makarov, his guest, Vasili Verestchagin (q.v.), the famous war-artist, 16 staff officers and over 800 sailors perished

MAKART, mäk'art, Hans, Austrian painter: b. Salzburg, 28 May 1840; d Vienna, 3 Oct. 1884 He began his art studies in the Academy of Vienna. In 1859 he went to Munich, and painted in the studio of Piloty, under whose teaching (1861-65) he developed remarkable tal-

ent as a colorist. His earliest success was a Rembrandtesque picture of 'Layousier in Jail' (1862) His first work to gain him wide fame was his three-paneled picture, 'The Seven Deadly Sins' or 'The Plague in Florence,' which aroused a storm of adverse criticism, wonder and admiration in Paris and Germany In 1869 the Emperor Francis Joseph built him a fine studio in Vienna, and he produced his series of 'Abundantia' pictures, 'Fruits of the Earth', 'Fruits of the Sea.' In 1873 followed the picture which attracted so much attention in the Exhibition of Philadelphia (1876), his 'Venice Doing Homage to Caterina Cornaro,' now in the National Gallery at Berlin He traveled in the East during the winter (1875-76), and his Egyptian sketches materialized in his 'Cleopatra,' 'Antique Hunt on the Nile,' etc. His 'Entry of Charles V into Antwerp' (1875-78) gained a medal at the Paris Exposition of 1878 and his 'Diana's Hunting Party' is one of the most successful of his larger paintings, combining superb coloring and modeling of the nude with grand landscape effect It is in the Metro-politan Museum of New York and is most characteristic of the gorgeous sensuousness of a painter who woke the intellectualists of German art to a sense of color, and broke free from the traditions of a somewhat stiff and pedantic method, gaining in life and intensity what he sacrificed of academic correctness. Consult Lutzow, 'Hans Makart' (1886); Stiassny, 'Hans Makart und seine bleibende Bedeutung' Consult

MAKAW, or MACKAH, MACCAW, MACKAW, MI-CAW ("CAPE PEOPLE"), Indian tribe of Cape Flattery, Puget Sound, Washington They are the southernmost tribe of the Wakashan stock and the only one within the boundaries of the United States They are of the Nootha branch. They claimed a considerable territory between Flattery Rocks and Hoko, but ceded to the government all these lands except that in the immediate vicinity of Cape Flattery in 1855 The Makaw reservation was defined in 1873, and an added reservation for the use of the tribe was established in 1893 and is known as the Ozette. On the two reservations there were in all 465 Indians in 1905, and their numbers are diminishing In 1806 Lewis and Clark estimated the tribe to number 2,000. They are of peaceful habits, are skilful fishermen and expert at water craft

MAKEMIE, Francis, pioneer of the Presbyterian Church in the United States: b. Rathmelton, County Donegal, Ireland, 1658; d. Accomac County, Va., 1708. He was a born missionary and zealot, and on being licensed by the presbytery of Laggan sailed for the British West Indies, and began work in Barbadoes In 1684 he sought a wider field in Maryland and organized the first Presbyterian congregation at Snow Hill, capital of Worcester County, Md. After 10 years' labor as an itinerant preacher in most of the Southern States he returned to England and induced two other ministers to accompany him back He was the first moderator of the presbytery of Philadelphia (1706), which he assisted in forming; and visited New York (1707), where he was imprisoned for preaching, though when brought to trial was acquitted of lawbreaking. Consult Briggs, 'American Presbyterianism' (1885); Sprague,

W. B, 'Annals of the American Pulpit' (Vol. III, New York 1858).

MALABAR, mål-a-bar', British India, in the presidency of Madras, in the southwest, bordering on the Arabian Sea. It occupies an area of 5,795 square miles A great portion is low land along the coast, rising abruptly at the east where it is bounded by the Western Ghats. The western part is intersected by long, narrow ravines, and the whole is covered with vegetation, in many places large forests. About 38 per cent of the total area is under cultivation and 33 per cent is forest. The average annual rainfall is 116 inches The climate, though damp, is fairly healthful. There are a number of tea and coffee plantations and a large amount of rice is raised The principal towns are Cochin, Callicut, Tellicherri, Kananur and Mangalore. The name Malabar is often applied to the whole extent of coast country from Cape Comorin as far north as Bombay. Pop. including the Laccadives, 3,015,119, of which 68 per cent is Hindu, 30 per cent Mohammedan and 2 per cent Christian.

MALABAR NIGHTSHADE, a succulent edible vine See BASELLA

MALABÓN, Santa Cruz de, san'ta crooth dā ma-la-bōn', Philippines, a pueblo of the province of Rizal, Luzon, also known as Tambóbong. See Tambóbong

MALABUYOC, mà-la-boo'yŏk, Philippines, a pueblo of the province of Cebú, situated at the mouth of the Malutuoc River on the strait of Tañon, 60 miles southwest of Cebú, the provincial capital Pop. 13,120.

MALACCA, mą-lak'a See Straits Settle-MENTS.

MALACCA, Strait of, the channel between the Malay Peninsula and the island of Sumatra, extending from lat. 1° to about 6° N. Entire length, about 520 miles; breadth, varying from 25 miles to 250 miles.

MALACCA CANE, an erect, slenderstemmed palm (Calamus scipionum) which, when dressed, is of a brown color, sometimes mottled or clouded. It is used principally for walking-sticks, and is brought from Singapore and Malacca, but is chiefly produced in Sumatra.

MALACHI, măl'a-kī, one of the 12 minor Hebrew prophets, after whom the last canonical book of the Old Testament is named The date of the book is assigned to 460-450 BC. Nothing definite is known of the author whose name in Hebrew signifies "My Messenger" Jerome supports a tradition given in the Hebrew targum of Jonathan which identifies Malachi as a pseudonym of Ezra (qv) "The Scribe." The general style, the character of the arguments and preachments against the evils of the times, of the book of Malachi (qv), are in favor of the tradition.

MALACHI, Book of. The book is perhaps actually anonymous. The author's name appears only in i, l, which is very probably an editorial addition. The word Malachi means "My messenger," and may have been taken from iii, 1.

There is no serious question affecting the authorship of more than a few verses of the book. It has often been thought that ii, 11f expresses a spirit of narrow Judaism which is

inconsistent with i, 11 This is so upon one interpretation of the latter passage which makes it refer to the turning of the nations to Yahweh either in the present or the future. That, however, is probably not the correct interpretation. The verse in the context, particularly in relation to the following verse, seems to be clearly present and not future. At present it is not susceptible of the broader meaning given; that could not have been true at any probable time of writing. Hence the probable meaning is rather that worship is offered by Jews who are scattered widely among the nations; the reference is to the faithfulness of the Jews of the diaspora. Thus understood it is not inconsistent with ii, 11f.

Verses 4-6, chap. iv, are quite certainly a later addition. Verse 4 is a legal gloss, quite different from anything else in the book; verses 5-6 are a gloss upon verses 1-3, a restatement of much the same idea but from a different standpoint, one that is out of harmony with the

book.

The mention of Edom, i, 2-4, gives a general indication concerning the date of the book. These verses indicate some recent crushing disaster to Edom, which is narrated in a spirit of hatred to Edom. This hatred began, the history shows, with the treacherous violence of Edom at the destruction of Jerusalem in 586 The disaster here referred to was doubtless one that came from the invasion of the Nabateans, and might have taken place at any time during a considerable period before 312 BC. The general time between 586 and 312 is thus indicated. The temple had been rebuilt after the exile, i, 10; iii, 1, 10, and the enthusiasm of the time of its rebuilding had passed away. This indicates a time considerably after 516 BC. The general condition of the people is that of the time of Ezra and Nehemiah, with the temple service in disorder and disrepute, i, 6-8, 12-13; ii, 1, 8, 17; iii, 7-10, 14, see Nehemiah x, 32-39; xiii, 10-13. Also, the divorce of Jewish wives and the marrying of foreign wives were found frequently, ii, 10-16, see Ezra, ix-x; Nehemiah x, 28-30; xii, 23-31. There is in the book, however, no reference to the work of Ezra and Nehemiah. Hence the book is to be assigned to the period before their activity, and presumably not long before, perhaps about 460 B.C.
The message of Malachi was intended to be

rine inlessage of Malachi was intended to be primarily one of encouragement to the discouraged people in Palestine. The principal comprehensive thought of the book is that Yahweh still loves Israel, in spite of appearances to the contrary. This is stated at the beginning of the book, in i, 2-5 The reason assigned for the adverse conditions from which the people were suffering was the failure of the people to do their duty toward Yahweh. This was particularly a failure in relation to the outward national service. The outlook of the prophet is, therefore, in a considerable measure, formal Yet this formal side is accompanied by a real ethical interest, as appears in ii, 27. A high standard for priestly activity is set up in ii, 7. The assurance of further prosperity for the people if they amend their ways is in connection with the coming of the day of Yahweh.

with the coming of the day of Yahweh.

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MALACHITE, a native basic copper carbonate and hydrate, having the composition CuCo₃ Cu(OH)₂, crystallizing in the monoclinic system, but commonly occurring in massive form, or as an incrustation It is brittle and has a specific gravity of about 4, and a hardness of from 35 to 4 Malachite is commonly subtranslucent, with an adamantine lus-It is beautifully gieen in color, often banded with other colors and it occurs in many parts of the world, usually in connection with other ores of copper. Specially fine pieces are found in the Ural district, and at the Nizhne Tagilsk copper mrnes a deposit is known which contains at least half a million pounds of pure malachite In the United States, the bestknown deposits are those of Arizona. Malachite has been much prized as a gem stone and it is extensively used for panels, clock cases, table tops and other ornamental work

MALACHY, Saint, Irish bishop b. Armagh about 1094; d Clairvaux, France, 1148 He belonged to the noble family of O'Morgair. was educated by Iombar, an anchorite, and or-dained priest in 1119 He afterward studied at Lismore, and returning to Armagh was chosen bishop of Down and Connor (1125). His subsequent election to Armagh having been disputed (1129) he eventually, after a satisfactory settlement of the disputed questions and in accordance with his own desire, returned to the less important diocese, where he labored to secure for the Church a stronger foothold In 1139 he set out on a mission to Rome On his way thither he visited at Clairvaux and there began a lifelong friendship with Saint Ber-nard. He was commissioned in 1148 to go to Rome a second time, but was stricken on the journey and the last moments of his life were spent with Saint Bernard, at whose monastery he had stopped. He was a zealous reformer and to him is given the distinction of having opened the first Cistercian monastery in Ireland. The document known as Prophecy of Saint Malachy, containing a Latin motto for each of the popes, is now considered not to be his production. He was canonized in 1190. Consult O'Hanlon, 'Life of Saint Malachy' (1859); Migne, J. P. (Patrologia Latina) (Vols. CLXXXII, CLXXXIII).

MALACOLOGY. See Mollusca.

MALACOPTERYGII, măl-a-kŏp-te-rĭj'ī-ī, or MALACOPTERI, a group of fishes, in former systems of classification, including those with jointed and spineless or "soft" fin-rays. Compare Acanthopterygii; and see Ichthyology

MALACOSTRACA, one of the two primary divisions of the Crustacea to which all of the larger and more highly organized forms belong The number of pairs of appendages and of segments is definite, the former being always 19 and the latter 19, except in the order Leptostraca which have also two abdominal

The boundary between segments limbless head and thorax is not always clearly defined but the two always comprise 13 segments, of which five almost always belong to the head: the abdomen has six limb-bearing segments and is terminated by the telson which is probably a seventh segment. The head bears a pair of eyes, usually stalked, two pairs of antennæ, a pair of crushing jaws or mandibles and two pairs of maxillæ, to which a pair of maxilli-peds is sometimes added (Arthrostraca) Of the typically eight thoracic segments from one to three bear maxillipeds and the remainder walking feet In most cases the thorax is more or less completely covered by a carapace mode of development is varied, sometimes, as in the crayfish, it is direct, sometimes with a nauplius, but usually through the larval form called zoæa (see LARVA), which possesses paired eyes as well as a median eye, a swimming tail and usually seven pairs of appendages. The subdivisions are

Order Leptostraca (Nebalia)
Order Arihrostraca { Amphipoda (beach fleas) | Isopoda (wood lice) | Cumacea (Diastylis). | Stomatopoda (Squilla) | Schizopoda (Mysis). | Macrura (lobsters and beapoda | Shrimps). | Brachyura (crabs).

See CRUSTACEA

MALADE IMAGINAIRE, ma-lad ē-mā-zhē-nār, Le, a comedy in five acts by Molière It was produced in Paris (1673), was the last work of its author and the last in which, as Argan, he appeared on the stage. See Molière

MALAGA, măl'a-ga (Sp mal'a-ga, ancient MALACA), Spain, capital of the province of Malaga, on a small arm of the Mediterranean, about 65 miles northeast of Gibraltar It was Phænician and afterward a Carthaginian colony, was a flourishing city under the Romans and its long occupation by the Moors has left distinct marks in the older parts of the town; the Gibralfaro, or Moorish castle, on a hill overlooking the town, and considerable portions of the ancient fortifications, yet remain. Among the important buildings are the cathedral, a highly decorated structure in the composite style with a spire 300 feet high; the episcopal palace, custom-house and several hospitals and charitable institutions, etc. The manufactures consist chiefly of iron, the ore of which is obtained from rich mines in the vicinity; soap, cottons, linens, machinery, etc. derful gardens lie outside the town, like the Haciendas de la Concepción and De San José, where marvelous effects are produced by carefully tended sub-tropical vegetation the coast in the direction of Vélez Malaga are ancient Moorish watch-towers, used, after the fall of Granada, against the Moors themselves, who often descended upon the coast to plun-der and destroy The harbor is excellent and the trade is of importance, the principal ex-ports being olive oil, lead in bars, wine and fruit, particularly raisins, oranges and almonds. There used to be a great export of raisins to the United States, the consumption of which, however, declined in favor of the California product. The climate, mild, dry and equable, makes Malaga one of the finest resorts for invalids in Europe, Pop. 203,000

MALAGA WINE, a sweet Spanish wine produced in the province of Malaga It is one of the "muscatel" wines, and is rich, luscious and full of body. See WINE AND WINE-MAKING

MALAGASY SUBREGION, a faunal division of the Ethiopian Region in Zoogeography which embraces Madagascar and some small neighboring islands. See MADAGASCAR; ZOOGEOGRAPHY

MALAKOFF, ma'la-kŏf. See SEBASTOPOL.

MALAMPAYA, ma-lam-pa'ya, a sound on the northwest coast of the province of Paragua, island of Palawan, Philippines; it is an arm of the China Sea, extending 24 miles northwest to southeast, and from three to six miles wide. It is entirely landlocked, Tuluran Island protecting it from the China Sea, and is entered by Blockade and Endeavor straits. Its depth varies from 36 to 54 feet, it is free from sunken dangers to navigation, is one of the finest harbors in the Philippine Archipelago and has been suggested as one of the best locations for a naval station between Balábac and Manila.

MALANAO, ma-la-now', the name commonly given the Moros, especially Ilanos, who live on the shores of Lake Malanas, island of Mindanao See Philippine Islands

MALAPROP, Mrs., a character in the 'Rivals' of Sheridan Like Shakespeare's Dogberry she is made to employ words of the same length, accent and more or less similar vowel and consonantal value, interchangeably. Hence her well-known "Allegory on the Banks of the Nile"; "Derangement of Epitaphs"; "A Barbarous Vandyke," etc

MALAPTERURUS. See ELECTRIC FISHES

MALAR, mā'lar, Lake of, Sweden, a lake running inland from the Baltic about 81 miles, with an average breadth of 13 miles and an area of 450 square miles. It contains upward of 1,200 islands. Its east end is closed by Stockholm, where its waters are poured into the Baltic by various channels, the difference of level being about six feet. It is surrounded by the populous districts of Stockholm, Nykioping, Upsal and Westeras, and the shores are varied with bays and hills, woods, lawns and cliffs, and are adorned with many castles, country-seats and villas, including the royal palaces of Drottningholm and Gripesholm.

MALARIA, an infectious disease due to animal parasites and which is characterized by intermittent attacks of chills and fever, socalled intermittent fever, or a continued fever with remissions; or by a chronic malarial cachexia. Malaria is a disease which is very widely distributed. It is found throughout Eu-10pe, particularly in the more southerly regions, Italy and Spain, but is absent in the more northerly parts of the Continent, where the temperature prohibits the development of the mosquito, the chief carrier of the disease. In Asiatic countries, particularly in India, malaria is very frequent; and in Africa different types of malarıal fever constitute a feature most obnoxious to colonization In the United States, particularly in the Southern States, malaria prevails. Along the New England coast, where it at one time was very common, it has become much diminished in prevalence and in severity. The Pacific Coast region is free from the disease,

MALARIA 160

and the Northwest States are comparatively In the region of the Saint Lawrence

River malaria is unknown

In order to understand clearly the different forms of malarial fever, it is important to bear in mind that the different types are due to minute animal parasites which enter the blood, usually by the bite of one of a particular genus of mosquitoes (Anopheles) (See Mosquitoes AND THE PROPAGATION OF DISEASE). The parasite develops after its introduction into the blood and, according to the individual type that is introduced, certain variations in the developmental history of the disease result. The parasites themselves, which are thought to be low forms of animal life, protozoa, develop, for the most part, in the red blood-corpuscles and have many allies in the red blood-corpuscles of other animals, as frogs, fish, birds, monkeys, cats,

These organisms were first clearly demonstrated by Laveran, a French army surgeon, in 1880, and his early observations were enlarged and amended by Golgi, Marchiafava and Celli, Manson and Ross, and a host of others the present time at least three forms of the parasite Hæmatozoa malariæ are known, the parasite of tertian fever, the parasite of quartan fever and the parasite of æstivo-autumnal fever. These parasites have two cycles of development, one taking place in the body of man and the other in the body of the mosquito. Thus a patient with malarial fever infects a mosquito with a parasite which undergoes certain transformations within the body of the mosquito, and is then in turn introduced into the body of another patient, to cause typical attacks of fever according to the type of parasite introduced. Occasionally two different parasites are introduced into the patient's body and a mixture of the two forms of the disease

results.

The commonest form of malarial fever (the so-called chills and fever, or ague) is due to the tertian and quartan parasites In these, after an unknown period of incubation, probably from 36 hours to 15 days, the patient has a feeling as though he were going to be sick, sometimes with headache, sometimes a feeling of lassitude and a desire to yawn and to stretch Occasionally the patient has nausea and vomiting. At the same time the temperature has begun to rise and a chill commences He begins to shiver, the face becomes drawn, thin and cold, the body shakes, the teeth chatter and the skin may be cold and blue, although the internal temperature is known to be gradually rising After from 10 to 15 minutes, or perhaps a longer time, the chill is followed by a hot stage The coldness of the surface disappears and the face becomes congested and flushed, the skin is red, the pulse is full and the patient may have a throbbing headache, with mental excite-ment. Thirst is excessive. Then the period of sweating begins, the whole body being covered with perspiration; the temperature drops, the headache disappears and in an hour or two the paroxysm is over.

A number of variations from this typical form are known. In the tertian type of fever the chill and fever usually occur every other This is due to the fact that the cycle of development of the tertian parasite is about 48 hours and that the stage of full development of the parasite, or sporulation, which is more or less coincident with the attack, occurs at these times. Thus every third day the patient has an attack, hence the term "tertian" In the mixed infections, when two sets of parasites develop on alternate days, the paroxysms of chills, fever and sweating may occur every day. In the quartan type of fever the cycle of development of the parasite is completed every fourth day. Mixed infections also occur in this form of the disease. In the northern United States these are the types of malaiia which are more common, but below Mason and Dixon's line a much severer form of the disease is present is the æstivo-autumnal type, which gives rise to the so-called bilious remittent fevers and typhomalarial fevers of the South In these the symptoms are extremely irregular The paroxysms occur every 24 or 48 hours, and longer remissions are known The length of the paroxysms is usually longer, lasting 20 hours, instead of 10 or 12 as in the tertian form; the onset of the disease is usually slow and gradual; and there may be no chill Occasionally there is a continuous fever without much break, the temperature ranging from 102° to 103° F. Jaundice is not infrequent, and this, with the fever and a furred tongue and mental disturbance, often gives rise to the suspicion of typhoid fever. In the simpler types the patient may get well after 10 days or two weeks without any special medication. The more severe forms may be fatal unless prompt diagnosis and medication are instituted. The diagnosis of malaria should always include an examination of blood and the demonstration of the parasite. In the vast majority of untreated cases the parasite can be found Occasionally, however, repeated examination fails to show it

Treatment should be prophylactic as well as actual and attention should be paid to the avoidance of infection no less than to care of the disease itself. Rigid protection of houses by means of screens to keep out the Anopheles, is one of the most important procedures. Furthermore, it is highly essential that the mosquitoes themselves should be protected from the infection by screening all patients suffering from malarial fever. In order to do this the patient's couch should be surrounded by mosquitonetting and all mosquitoes in the room of the malarial patient should be killed by means of pyrethrum-powder. Further measures for destroying malaria should be taken by draining off swamps and employing proper engineering methods in order to get rid of the mosquitoes themselves. The planting of swamps with leafy trees often dries them up and thus prevents the formation of breeding-places for mosquitoes Finally the specific, quinine, should be used in all cases It is a prompt and sure parasiticide and in its varied forms can be used by almost every patient, despite individual

idiosyncrasies

In the consideration of some of the chronic forms of the disease a number of perplexing conditions are met. Thus, following constant exposure to malaria and repeated attacks of the disease, symptoms of anæmia, of breathlessness, swelling of the feet and ankles, bleeding in different parts of the body and enlarged spleen may be found. This is a type of infection known as malarial cachexia. It is found in southern countries and should be distincted. from the cachexia due to various forms of intestinal parasites See Mosquito; Miasma;

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MALARIAL CACHEXIA, or ANÆ-MIA. See HOOKWORM DISEASE

MALARIAL FEVER. See MALARIA.

MALASPINA GLACIER, Alaska, glacier extending from Mount Saint Elias, at an elevation of 18,000 feet, to Yakutat Bay, a distance of 90 miles, while its front on the Pacific is between 60 and 70 miles wide. The pacific is between 60 and 70 miles wide It was named in honor of the Spanish explorer, Alejandro Malaspina, who traversed the region in 1789-94 in search of the Northwest Passage With its tributaries, the Seward, Agassiz, Tyndall and Guyot, the Malaspina covers some 1,500 square miles of ground, and has a depth of more than 1.000 feet. As it reaches the Pacific it breaks into dangerous icebergs which threaten navigation, but leaves a front of great ice palisades

MALATESTA, a noble Italian family, leaders of the Guelphs in Romagna and rulers in Rimini in 1216-1528 Giovanni and Malatesta of the Malatesta tribe entered Rimini in 1216 and were granted citizenship in consideration of their aid against Cesena. The family rapidly gained in power and in 1237 Giovanni was named podestà. He was succeeded upon his death in 1247 by his son, Malatesta de Verrucchio, who became supreme ruler in 1295 and who steadily increased his power until his death in 1312 at the age of 100 years. He also increased the power of the Guelphs and enjoyed the favor of Pope Boniface VIII. Of his four sons, two were Giovanni and Paolo, husband and lover of Francesca da Rimini, whose story is told in Dante's 'Inferno' Malatestino, the eldest son of Malatesta, succeeded him upon his death in 1312, maintained the power of the Guelphs, annexed Cesena and dying without issue in 1317 was succeeded by his youngest and only surviving brother, Pandolfo The power of the Malatestas was extended over neighboring territories in succeeding years and the family became one of the most influential of the Renaissance Carlo (b 1394; d 1429) was an ardent supporter of the popes, represented Gregory XII at the Council of Constance and was named vicar of the church in Romagna. His nephew, Sigismondo (b. 1417; d. 1468), was a valiant soldier, a patron of arts and letters as well as a poet and renowned antiquarian. He built the church of Saint Francis, or temple of Malatesta, one of the most beautiful structures of the Renaissance. He made war for and against Pope Eugenius IV; against Venice and Florence with the Aragonese, then against the Aragonese at Piombino He afterward fought with and against the Sienese, supported the cause of the Angevins and was excom-

municated and burned in effigy by Pope Pius II. He was afterward restored to the Church but before his death he was practically stripped of his powers and possessions. He was succeeded by his wife, Isotta, and his son, Salustio, but both were murdered by an illegitimate son, Roberto. Roberto's son, Pandolfo IV, was the last Malatesta to rule Rimini, and he sold his rights to the Venetians in 1503 Thereafter the Malatestas at various times endeavored to regain control of Rimini until 1528 when it was incorporated in the papal states. The Malatestas became citizens of Venice and the Rimini branch became extinct in 1716 Consult Battaglini, 'Memorie Storiche di Rimini e de suoi signori? (Bologna 1789); Fossati, 'Le tempi di Malatesti de Rimini? (Foligno 1794); Hutton, 'Sigismondo Malatesta? (1906).

MALATIA, MALALIETH, or AZPUZU, Asiatic Turkey, chief town and military post in the vilayet of Malatia at the foot of the Taurus, on the Samsun-Sivas-Diarbekr Road, 10 miles southwest of the junction of the Tokhma-Su with the Euphrates and 100 miles northeast of Marash The town is modern, being practically rebuilt since the earth-quake of 1893; and previous to that dating to the middle of the 19th century when the old Malatia was abandoned after its destruction in the military operations of Hafiz Pasha, the new town being built on the site of the former summer colony Azpuzu The old town of Malatia (ancient Melitene) lies five miles to the northeast of the present town and is now known as Eskishehr It has many inhabitants, extensive gardens and interesting ruins. It was the station of the 12th, or "Thundering Legion," under Titus and was raised to a city under Trajan. It was capital of Armenia Tertia under Justinian. It changed hands between the Greeks and Saracens several times, was reputed to possess 60,000 fighting men at the opening of the 11th century and in 1102 was returned to Saracen control. The modern Malatia is an important trading centre and the district is famous for its orchards and vine-yards. A fine grade of opium is also produced. There are Roman Catholic and Protestant mis-sions. The population includes many Christian Armenians besides the Turks and Kurds. There was a massacre of Christians in 1895 Pop. (estimated) 75,000.

MALAUEC, ma-low'ek, a provincial language, used largely in commerce in Luzon, Philippine Islands (qv)

MALAY (mā-lā) ARCHIPELAGO. See East Indies of Malay Archipelago

MALAY PENINSULA (Malay, Tanah Malayu, or Malay Land), a long strip of land extending from Indo-China south and southeast toward the island of Sumatra, the most southerly part of the Asiatic continent. The peninsula begins properly at the head of the Gulf of Siam, and would thus include part of Siam proper and the British province of Tenasserim; but it is usual to limit the name to the portion south of the river Pakshan, the frontier of Tenasserim. In the larger sense, the length of the peninsula is about 870 miles long and its area 83,000 square miles; the population is estimated at about 2,000,000. The width varies

from 45 miles to 210. The interior consists mainly of magnificent wooded granite mountain ranges, some of whose peaks attain a height of 7,000 feet; while along the coast there is almost everywhere a flat and fertile belt, fringed with numerous islands. There are numerous small rivers. The mean annual temperature near the sea is about 80°. is no winter, but rains are frequent through the year. The humidity of the climate renders it very trying to foreigners Tigers and leopards are numerous and of great size The Indian elephant, the rhinoceros and several species of monkeys are found; also the vampire bat, poisonous snakes and many beautiful and brilliant birds. Tin abounds and is largely worked. Silver and gold are also found in paying quantities There are over 40 varieties of palm in the peninsula and the vegetation is that of the luxuriant tropical kind. In physical features the peninsula resembles rather the islands of Sumatra and Java than Indo-China. The inhabitants are mainly Siamese in the north, civilized Malays (qv) along the coast and univilized Malays (qv) along the coast and uncivilized Malays, mixed with aboriginal Negrito tribes, in the interior. Politically, the northern part of the peninsula is occupied by small states tributary to Siam (as far south as 5° N.); the southern part by Malay states under British protection (as Perak, Salangor, Negri Sembilan, and Pahang, known as the Federated Malay States) and the British Crown colony of the Straits Settlements, comprising Singapore, Malacca and Penang. (For the commerce, industries, education, transportation facilities of the peninsula see articles on the tacilities of the peninsula see articles on the individual states or groups of states, as Federated Malay States; Burma; Perak; Pahang; Singapore; Straits Settlement). Consult Bishop, 'The Golden Chersonese' (London 1883); Clifford, Hugh, 'Studies in Brown Humanity' (ib. 1898); id, 'In a Corner of Asia' (ib. 1899); Lucas, 'Historical Geography of the British Colonies' (Oxford 1894); Rathbone, 'Camping and Tramping in Malay' (ib 1898); Skeat, W. W, 'Malay Magic: An Introduction to the Folklore and Popular Religion of tion to the Folklore and Popular Religion of the Malay Peninsula' (ib. 1900); Foran, W. R., 'Malayan Symphony' (London 1935); Winstedt, R. O., 'History of Malaya' (London 1935); Winstedt, R. O., 'History of Malaya' (London 1935); Bush, W. C., 'Pahang' (New York 1938); Emerson, R., 'Malaysia' (New York 1937).

MALAY STATES. See FEDERATED MALAY STATES.

MALAYALAM, an independent Dravidian dialect of southern India, originally allied to Tamil and spoken on the Malabar Coast by between six and seven million inhabitants called Malayalim or Malabars who form a separate race with distinctive castes, customs, traditions and literature. Malayalam is said to have developed from Tamil since the 9th century and now differs from it in pronunciation and in idiom, and in the retention of old Tamil forms obsolete in the modern languages. Sanskrit words are more numerous in Malayalam, while in Tamil, they are less than in any other Dravidian tongue. Malayalam appears about Ad. 1150 in inscriptions of the rulers of Kerala from Travancore and has an extensive literature, of which the 13th century epic 'Ramacharitam,' the oldest poem in the language, and a collection of 1,000 Malayalam proverbs published in Man-

galore in 1868 are notable examples. See Dravidian Consult Ellis, F. W., 'Dissertation on the Malayalam Language'; Gundert, 'Malayalam Dictionary' (1872); Frohmeyer, 'Progressive Grammar of the Malayalam Language for Europeans' (Mangalore 1889); Menon T. K. K., 'Notes on Malayalam Literature' in Royal Assatic Journal (London 1900).

MALAYAN BEAR, or SUN BEAR, a small bear (*Ursus malayanus*), found in the Malayan Archipelago, Borneo, Sumatra and Java. It is about four and a half feet in length; the fur is black, fading into brown on the nose which is remarkably broad and blunt. The chest bears a crescentic white mark, or an orange-colored, heart-shaped patch.

MALAYAN SUBREGION, a faunal division of the Oriental Region, composed of the southern end of the Malay Peninsula and all the islands of the Malay Archipelago as far as the Philippines and to the Straits of Macassar, where this district is separated from the Australian and Papuan subregions by Wallace's line (qv). The fauna of this subregion is composed of animals adapted to a uniform but not extreme heat, coupled with abundant moisture. The orang-outang and the birds of paradise are its most characteristic groups. See DISTRIBUTION OF LIVING MAMMALS; ZOOGEOGRAPHY.

MALAYS, a race of people inhabiting the Malay Peninsula and the Malay Archipelago, and claiming to have their native country in the highlands of Sumatra. The civilization of India appears to have extended itself to the Malays at an early date. In the 13th cen-Malays were on the peninsula of Malacca, where they built a city of the same name, and founded an empire. The sultans had subdued Sumatra previously to their settling in Malacca. They afterward possessed themselves of the rest of the Sunda Isles, of the Philippines, the Moluccas and some of the Australian groups, where Malay tribes are found resembling, in their features, religion and government, the Malays of Malacca. At that time they acted a splendid part in Asia; they carried on commerce, in part with their own ships, and planted colonies. Great numbers of ships from China, Cochin China, Hindustan and Siam filled the harbors of Malacca. They are now divided into distinct tribes, without any general head. This is partly owing to the superiority which the Europeans, particularly the Dutch, have obtained in the Indian seas, and partly to the feudal system of the Malays, by which the national power has been divided and a common spirit prevented by the increasing power of the vassals The civilized Malays profess the Mohammedan religion. Besides the Koran, the Malays have various local laws. They are fierce and warlike, always bearing arms, and much addicted to the use of force, addicted to piracy. The Malay language is widely used as the language of commerce throughout the South Seas and in the islands south of the Philippines. Physically considered the Malay are of low attentional property in former than Malays are of low attentional property. the Malays are of low stature, slight in figure and with very small wrists and ankles. The and with very small wrists and ankles. The face is round, the eyes black and somewhat almond-shaped, the nose short and small, cheek bones prominent, features flat, the hair straight

and black, the complexion yellowish In various respects they bear a close resemblance to the Mongolians of eastern Asia, but differ from them radically in language, all their dialects belonging to a distinct Malayo-Polynesian family which is widely distributed throughout the Indian and Pacific oceans. The Malays long pursued a piratical career, darting from hidden streams in their well-manned proas on any vessel that approached too near the coast, or more boldly lying in wait in fleets in the open sea, for any expected rich prize Of late years the lessons taught them by European and American war vessels have forced the Malays to desist from piracy, their old lawless, roving habits being largely abandoned for their more settled occupations of trade and agriculture. Among the many Malay tribes are the Sakais, or treedwellers, who build their houses in forked trees, 8 to 12 feet above the ground, reached by bamboo ladders which are hoistd at will. The tree-dwellers formerly made use of long blow-guns shooting poisoned arrows The bamboo furnishes most of their articles of ornament and utility The blow-gun was a bam-boo about an inch and a half in diameter and six and a half feet in length The bore, drilled most accurately, was a quarter of an inch, and the darts nine inches in length, about the circumference of a heavy darning-needle, sharp-ened at one end and poisoned With these they secured all the meat they eat in the jungle— birds, monkeys, snakes and lizards. They also have knives made of bamboo.

The Malay intellect varies from that of savagery in the uncivilized tribes of the interior to a rather high degree of culture among the coast tribes. Much of their civilization is due to foreign influences, chiefly Hindu and Arab The Malay language, which is soft and harmonious and of simple structure, is written in the Arabic character, which is ill suited for the purpose Lately the Roman system has been largely adopted, especially in the Dutch and English dependencies. The literature, which is copious, comprises poetical compositions, such as rhyming-proverbs, love-songs and dramas displaying some originality, but little imagination. The prose writings are mostly

based on Arab or Persian models.

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of Java' (London 1817); Skeat, W. W., 'Malay Magic' (London 1900); id, 'Fables and Folk-Tales from an Eastern Forest' (Cambridge 1901); Steven, 'Materialien zur Kenntniss der wilden Stamme auf der Halbinsel Malakka' (Berlin 1892); Van der Lith and Span, 'Encyclopadie van Nederlandsche-Indie' (Thr. Hague 1896); Wilkinson, 'Malay Beliefs' (London 1906); Winstedt, R. D, 'Malaya' (1923); id., 'Malay Grammar'; Wheeler, L. R., 'The Modern Malay' (1928).

MALBAIE, Canada. See MURRAY BAY.

MALBONE, măl-bon', Edward Greene, American painter: b. Newport, R. I., August 1777; d. Savannah, Ga., 7 May 1807. As a boy he was in the habit of frequenting the theatre at Newport to watch the painting of the scenes. At that early age he executed an entire scene, a landscape for the stage, the success of which encouraged him to devote his attention exclusively to painting. At 17 he established himself in Providence as a portrait painter. Meeting with success, he removed in 1796 to Boston, and during the next four years pursued his art in various cities. In 1800 he accompanied Washington Allston (qv.) to Charleston, and in the succeeding year the two young artists sailed for Europe. Malbone when in London was urged by Benjamin West to take up his permanent residence there with the prospect of ample professional employment; but he returned to Charleston in December 1801. For several years he painted miniatures in the chief cities of the United States with great reputation. His principal imaginative work is 'The Hours,' in which the divisions of the day are personified by female figures.

MALBROUK, mal-bruk', a yellowish, grizzled monkey of West Africa (Cercopithecus cynosurus), distinguished from other species of the genus (called guenons) by its wide flesh-colored face with a band across the forehead, the bristly whiskers and ventral part white.

MALCOLM, măl'kom or mâ'kôm, the name of four Scottish kings: MALCOLM I reigned from 943 to 954, and during this period occurred the cession of Cumbria to the Scots by Edmund I, the English sovereigm. MALCOLM II (d. Glams 1034), succeeded Kenneth II in 1005 and in his reign Lothian and Strathclyde were secured to Scotland. MALCOLM III, surnamed Canmore (Great Head); b about 1024; d near Alnwick, Northumberland, 13 Nov. 1093. After the murder of his father, Duncan, by Macbeth, he was assisted by Siward of Northumbria, and Edward, the Confessor. After the death of Macbeth he was crowned at Scone in 1057. In 1067 he granted asylum to Edgar Atheling, his mother, and two sisters (one of whom, Margaret, he married in 1068), with a number of Saxon exiles. His reign, though largely concerned in warring with England, had nevertheless an important bearing on the civilization and consolidation of Scotland. MALCOLM IV (the Maiden), d Jedburgh, 9 Dec. 1165, succeeded his grandfather, David I, in 1153. He suppressed two rebellions in his realm and surrendered Northumberland and Cumberland to Henry II in 1157.

MALCOLM, SIR John, British administrator and diplomatist: b. Burnfoot, Dumfriesshire, 2 May 1769; d. London, 30 May 1833.

Entering the service of the East India Company as an army officer in 1782, he rose to reach the rank of major general in 1822. In 1799 he was sent to Persia to negotiate a treaty of alliance against Napoleon, and he was ambassador to that country in 1800, 1807, and 1810. During 1804-1805, following the Second Mahratta War, he helped to restore order in Sindhia and Holkar; and in 1817 he was appointed political agent in the Deccan. From 1827 until his retirement in 1830 he served as governor of Bombay. He wrote several books on India, and The History of Persia (2 vols., 1815).

MALCZEWSKI, mal-chĕf'skē, Antoni, Polish poet b. Warsaw, 1793; d there, May 2, 1826 After serving in the Polish army during 1811–1816 he traveled through Europe, at that period becoming a close friend of George Gordon Byron (qv.). His principal work was the narrative poem Marja (1825), the literary merits of which were recognized only after his death. During his life none of his compositions brought him fame, and he died in wretched poverty.

MALDEN, mâl'dĕn, Mass., city in Middlesex County, on the Malden River 5 miles north of Boston; altitude 32 feet, it is served by the Boston and Maine Railroad. The city is both a residential suburb of Boston and an important manufacturing center, products including rubber shoes, shoe lasts and trees, women's and children's clothing, and leather goods. The public library, completed in 1885 to the designs of Henry Hobson Richardson (q.v.), houses a northbe collection of courtree by Except and American table collection of paintings by French and American artists. The Bell Rock Memorial Park, with a Civil War soldiers' and sailors' monument, marks the site of the town bell of colonial times by which the townsfolk were called to worship or to fight fire. The Parsonage House, 1724, was the home of the Rev. Joseph Emerson, ancestor of Ralph Waldo Emerson and the birthplace of the Baptist missionary to Burma, Adoniram Judson. Michael Wigglesworth colonial poet and preacher, was pastor here for some 50 years (qq.v). The first settlement, about 1640,. was made by persons moving out from Charles-town, which was expanding rapidly. They es-tablished homes along the Mystic River, of which the Malden is a branch, and called the place Mystic Side. In 1649 Malden became a separate municipality. Following its incorporation by the General Court, it had town government by a board of selectmen, until 1881, when it received a city charter. Since then the municipal government has been administered by a mayor with a bicameral body composed of a board of aldermen and a city council. Melrose was set off from Malden in 1850, and Everett in 1870. Pop. (1920) 49,103; (1930) 58,063; (1940) 58,010.

MALDEN, a South Pacific coral island 108 miles northwest of Starbuck Island and 275 miles southeast of Jarvis Island, within the jurisdiction of the high commissioner of the (British) Western Pacific Islands. The island, 35 square miles in extent, is uninhabited. There are remains of stone foundations for houses and temples which indicate that at one period the island was inhabited by Polynesians. No fresh water is now available, old wells having become salty or gone dry. During the 19th century extensive guano

deposits on Malden were worked by an Australian company.

MALDIVE, mal'div, ISLANDS, a chain of coral islands in the Indian Ocean 400 miles southwest of Ceylon, the archipelago constitutes a dependency of that British island colony The Maldives comprise several hundred islets, of which 300 are inhabited, grouped in 17 atolls. The inhabitants, who according to the 1946 estimate numbered about 93,000, speak a dialect of Singhalese and are Mohammedan in religion The capital of the dependency is on the island of Malé. A sultan (Lord of the Thousand Isles) is assisted by a People's Assembly, most members of which are elected. Dried fish, cowrie shells, coconut coir, and tortoise shell are the principal exports from the islands. The Maldivians are expert sailors and navigators, and carry on a considerable trade with India, Ceylon, and Sumatra. During the 16th century the Maldivians repelled numerous attempts by the Portuguese to establish a settlement on their islands. Subsequently they were attacked on many occasions by pirates from the Malabar coast of India, and as a consequence the Maldivians placed themselves under Singhalese protection in the 17th century. During World War II, a British naval port and airbase was constructed on the isolated atoll of Addu, southernmost of the Maldive Islands. Consult Hockly, T. W. A Short Account of the People, History, and Customs of the Maldive Archipelago (London 1935).

MALE FERN. See FERNS AND FERN-ALLIES.

MALEBRANCHE, mal-bransh', Nicholas de, French metaphysician: b. Paris, Aug. 6, 1638; d. there, Oct. 13, 1715. He was the youngest child of Nicolas de Malebranche, secretary to Louis XIII, and Catherine de Lauzon, sister of a viceroy of Canada In 1660, after studying theology at the Sorbonne, he entered the Congregation of the Oratory. He ranks second only to René Descartes (qv.), greatest of French thinkers, in the history of French metaphysical speculation. The essence of his philosophy, which was founded upon that of Descartes, is a sort of mystical idealism. As set forth in Mal-branche's brilliant work Recherche de la vérité (4 vols., 1674 ff), we have cognizance of things and objective realities as subjective thoughts and feelings, through the idea which resides in our souls, but this idea is in God, so that we perceive everything in God (vision en Dieu) as the primal cause of all existences and things. Hence the famous doctrine of Occasionalism or Interference, in accordance with which the objective thing and the subjective impression are made on every occasion to coincide, by the direct interposition of God, in whom alone we think and feel. In the history of philosophy Malebranche may be styled the connecting link between Descartes and Baruch Spinoza (q.v.), the difference between his philosophy and that of the pantheist tween his philosophy and that of the pantheist Spinoza consisting in the fact that to him the Universe was in God, and to Spinoza God was, in fact, in the Universe Other works included Traité de la nature et de la grâce (1680); Traité de la morale (1683); Entretiens sur la métaphysique et sur la religion (1688); Traité de l'amour de Dieu (1697). Consult Ollé-Laprune, L., La Philosophie de Malebranche (2 vols., 1870); Audré, La Vie du Révérend Père

Malebranche' (1886); Farny, 'Etude sur la morale de Malebranche' (1886). MALESHERBES, Chrétien Guillaume de Lamoignon de, krā-tě-ăn gē-yōm de la-moinon de mal-es-arb, French statesman: b Paris, Dec 6, 1721; d. there, April 22, 1794. He was educated at the Jesuits' College, entered the legal profession and in 1745 became counsellor of the parlement of France; in 1750 he was president of the Court of Aids He was broadminded and liberal in his policy, favoring the publication of the 'Encyclopédie' and owing to his protestation against different measures of Louis XV was removed from office Under Louis XVI he was Minister of the Interior, but resigned in 1776 and until the Revolution spent his time upon his estates and in travel, with the exception of 1787-88, when he was again Minister At the outbreak of the Revolution he came loyally to the assistance of Louis XVI and was leading counsel in his defense. He remained with the monarch until almost the last and 11 months later was guillotined for treason. He was the author of essays and pamphlets on financial questions, etc

MALET, Claude François de, klod franswa de ma-la, French conspirator: b. Dôle, Franche-Comté, France, June 28, 1754; d. Paris, Oct 29, 1812 He entered the army in 1771 and became a brigadier-general in 1799 Suspected of conspiracy against Napoleon, he was dismissed from the army in 1807 and confined in La Force. While there he laid new plots and was thenceforward confined in a state prison from 1808 till 1812 During Napoleon's campaign in Russia Malet made his escape from prison on the night of October 22-23, and by circulating the false news of Napoleon's death won over some of the National Guards While the latter secured the principal public offices in his name, Malet liberated his fellow conspirators, Generals Guidal and Lahorie, from prison. He was, however, himself taken prisoner by Laborde, chief of the military police of Paris, and was shot with his fellow conspirators.

MALET, Lucas. See HARRISON, MARY

SAINT LEGER

Giovanni Francesco MALFATH, seppe, Italian mathematician: b Ala di Trento, 1731; d Ferrara, 1807 He was educated at the Jesuit College at Verona and later studied under Riccatti at Bologna For 30 years from 1771 he was professor of higher mathematics at Ferrara and attained high rank among the mathematicians of his time. He is best re-membered for his publication of a mathematical problem known as "Malfath's problem," of which he gave the first solution It was published in a memoir 'Tentativo per la risoluzione delle equazioni di quinto grado' (Pavia 1772).

MALFORMATION IN PLANTS.

PLANTS, MALFORMATION IN.

MALHERBE, François de, fran-swä de mäl-ärb, French poet: b. Caen, France, 1555; d. Paris, Oct. 16, 1628. He was educated in Heidelberg and was engaged in the wars of the League. In 1605 he became court poet under Henry IV, but his work as a critic was of the court poet under the poet of the po greater value than his poetry, which was lacking in poetic feeling and originality, though metrically perfect. He was the founder of the French school of classicism and must be credited with arousing a critical sense among the thinkers of France His works consist of translations from the Latin and one volume of original verse Consult Allais, Malherbe et la Poésie française à la fin du XVI. Siècle' (1892), Brunot, 'La Doctrine de Malherbe' (1891).

MALIBRAN, Maria Félicité, mezzo-so-prano singer: b. Paris, 1808, d Manchester, England, 1836 She was early trained for the operatic stage by her father, Manuel Garcia (q.v), the Spanish tenor, and made her début in London (1825) She had lived in that city since 1817 as a teacher of singing, and her suc-cess in Rossin's 'Barber of Seville' was such cess in Rossini's 'Barber of Seville' was such that she was induced to follow her father to New York, where he had an engagement to establish grand opera Here she married a French merchant named Malibran She returned to the stage on her husband's failure in business, and in the spring of 1828 appeared on the Parisian boards in Rossini's 'Semiramis.' She subsequently was welcomed with great enthusiasm in London, Naples, Vienna, Milan and Venice, and traveled with the violinist de Bériot, whom she married shortly before her early death She was a great actress as well as a marvelous songstress, and the irresistible charm of her person, added to the generosity of her mind and disposition, made her during her brief career one of the most fascinating operatic career one of the most tascinating operatic singers that had ever won the applause of the European public In 1838 a statue was erected to her in Brussels, which had been her last place of residence Consult Nathan, 'Life of Madame Maria Malibran de Bériot' (1846), Teneo, M, 'La Malibran, d'après des documents inédits' (in 'Sammelbande der internationalen Musik-Gesellschaft,' Leipzig 1906).

MALIC ACID, an organic acid discovered in 1785 by Scheele, and now known to be widely diffused throughout the vegetable kingdom, occurring sometimes in the free state, and sometimes in the form of its potassium, magnesium or calcium salts. It occurs abundantly, for example, in the gooseberry, cherry, straw-berry and barberry, and also in unripe apples, from which latter fact it derives its name (Latin malum, an apple). It may be conven-iently prepared by boiling the juice of mountain ashberries with enough milk of lime to almost neutralize it, and pouring the precipitate into boiling dilute nitric acid Acid malate of calcium crystallizes from the nitric acid upon cooling, and this is dissolved in water, and pre-cipitated by acetate of lead, the lead malate that is thrown down being subsequently decomposed by sulphuretted hydrogen gas. Malic acid has the formula $C_4H_0O_5$ or C_2H_3 (OH) (COOH)₂, is dibasic, and can be obtained in the form of colorless prisms or needles, which are hygroscopic, and dissolve readily in water and in alco-hol Malic acid kills algæ, and when present in a solution in any considerable amount it prevents the precipitation of cupric and ferric salts by the alkalis. With bases it forms compounds known as "malates," which are mostly soluble. See Succinic Acid.

MALICE, in law, a premeditated or formed design to do mischief or injury to another, called also "malice prepense" or "aforethought." Blackstone says that malice prepense is not so properly spite or malevolence to the deceased

in particular, as any evil design in general; the dictate of a wicked, depraved and malignant heart, and it may be either express or implied in law Express malice is when one, with a sedate, deliberate mind and formed design, doth kill another. In many cases where no malice is expressed, the law will imply it; as where a man wilfully poisons another, in such a deliberate act the law presumes malice, though no particular enmity can be proved A spiteful, malignant, vindictive or revengeful disposition is apt to commit acts of malice both in the ordinary and the legal sense, and may be guilty in the former and not in the latter sense An injurious act emanating from a weak mind, a lack of caution or a sudden, unaccountable impulse, may have all the force of ordinary malice, but in the absence of a designed, intentional injury, it will not come within the strict limits of criminal malice. The law infers an intent to kill from the deliberate use of a deadly weapon, and it has been held that a burglar intended murder when he broke into a dwelling because he would commit it if necessary to escape.

MALICIOUS MISCHIEF, in law, any injury done to the person or property of another with deliberate malice This is an indictable offense both in Great Britain and the United States. The comprehensive English Black Act (so-called from its preamble that "several illdesigning and disorderly persons have of late associated themselves under the name of blacks") with others of a like kind were in 1861 codified (24 and 25 Vict, ch. 97) into an act which extends malicious mischief to buildings fels and a them are least to buildings, fish ponds and other real estate, as well as to most classes of personal property. To constitute this offense, real not merely legal malice must be proved, such as is defined by Blackstone, "a spirit of wanton cruelty or black and diabolical revenge"; or, as defined by the Supreme Court of Massachusetts, "a spirit of cruelty, hostility or revenge." This spirit must be charished by the offender not accurate. be cherished by the offender not against a third party, but against the party whose person or property has been injured Some States of the Union make secrecy a necessary element in the offense, others generalize the offense as implying merely the infliction of unlawful injury. If the injury was inflicted in the discharge of official duty, or under an honest sense of justification, this is sufficient defense to secure acquittal. The offense may be either a misdemeanor (q.v) or a felony (q.v.) according to its circumstances. Consult Bishop, 'Commentity of the control of the control of the circumstances of the control of the circumstances. taries on the Law of Statutory Crimes' (3d ed., Chicago 1901); McClain, 'Treatise on Criminal Law, as Now Administered in the United States' (Chicago 1897); and Harris, 'Principles of the Criminal Law' (London 1899).

MALICIOUS PROSECUTION, prosecution of a person unsuccessfully maticiously.

cution of a person unsuccessfully, maliciously and without cause. To constitute this offense it must be proved (1) That the prosecution it must be proved (1) That the prosecution averred to be malicious was instituted by the defendant named. (2) That it was decided against prosecutor. (3) That the suit was without probable cause. (4) That the motive was malice. (5) That the plaintiff was injured by such malicious prosecution.

Quod facit per alium facit per se is fully applicable to the defendant in a suit for mali-

applicable to the defendant in a suit for mali-

cious prosecution; hence a corporation may he liable though they acted through their agent (See Tort). Consult Newell, M. L., Malicious Prosecution, False Imprisonment and Abuse of Process' (Chicago 1892).

MALIGI, ma-lē-hē', Philippines, an island lying southeast of Talım Island ın the Bay Lagoon (qv); it is the seat of the United States military prisons

MALIGNANT PUSTULE. See A_N-THRAX.

MALIGNANTS, in English history, a name applied in 1643 by members of Parliament to designate those whom they considered to be the evil advisers of Charles I. Afterward the name was extended to all who sided with the king against the Parliament.

MALINAO, ma-lē'now, Philippines, (1) a pueblo of the province of Albay, Luzon, situated on the Lagonoy Gulf, 18 miles north by west of Albay, the provincial capital, and three miles north of Tabaco It is on the main road, and is the shipping point for the large hemp product of the surrounding region. There is an extinct volcano nearby and also mineral springs. Pop 12,437

MALINES, ma-lēn See Mechlin.

MALINGERING, ma-ling'gar-ing, a term denoting feigning disease on the part of a soldier, sailor, prisoner, etc, in order to obtain discharge from service, or escape from duty or labor. It implies some overt act, such as the previous application of a ligature, or the taking of some drug, which produced the appearance of the disease said to evict. A warse form of of the disease said to exist. A worse form of the same crime, "wilfully maining," is erroneously called malingering Consult Callie, John, 'Malingering and Feigned Sickness' (New York 1913); and Smith, W. R., 'Medical Jurisprudence' (London 1913)

MALL, Franklin Paine, American anatomist: b. Belle Plaine, Iowa, 1862; d. Nov. 17, 1917 He took his M.D. at Michigan in 1883, later studied at Heidelberg and Leipzig and in 1886-88 was a Fellow at Johns Hopkins, acting as instructor in pathology at that institution 1888-89. He was adjunct professor of vertebrate anatomy at Clark University in 1889-92, and was professor of anatomy at the University of Chicago in 1892-93. He was professor of anatomy at Johns Hopkins University after 1893 and after 1915 also served as director of the department of embryology at Carnegie Institute, Washington, D. C. He was a trustee of the Marine Biological Laboratory, Woods' Hole, Mass, and wrote extensively for scientific publications.

MALL, mâl or měl, The, (1) a promenade in Central Park, New York, regarded as one of the most successful landscape effects in the United States. (2) An avenue in London, on the north of Saint James Park.

MALLALIEU, măl-la-lū', Willard Francis, American Methodist bishop: b. Sutton, Mass, Dec. 11, 1828; d. 1911. He was graduated from Wesleyan University in 1857 and became a Methodist Episcopal clergyman in 1858. He held many important charges and in 1872, 1876, 1880 and 1884 was a member of the general conferences. He was presiding elder of the district of Boston in 1882–84 and in 1884 was elected bishop. He retired in 1904. He published 'The Why, the When, and How of Revivals' (1901); 'The Fullness of the Blessing of the Gospel of Christ' (1903); 'Words of Cheer and Comfort' (1907).

MALLARD. See Duck.

MALLARMÉ, Stéphane, stā-fān māl-armā, French poet. b Paris, March 18, 1842, d. Valvins, Fontainebleau, Sept 9, 1898. Most of his life was passed as an instructor in English at the Lycée Fontanes of Paris He is known as the founder of the curious poetic school of the "Décadents," in whose organ, Le Décadent, as well as in Le Parnasse Contemporain, he published much Incomprehensibility appears to have been the object of his study, and he entirely attained it in his preface to an edition (1880) of Beckford's 'Vathek' Others of his works are 'L'Après-midi d'un faune' (1876); 'Petite Mythologie' (1878); 'Les Dieux antiques' (1880); 'Poésies' (1887), a translation of Poe's poems (1888), perhaps his most satisfactory performance; and 'Vers et prose' (1893).

MALLEABILITY, in metallurgy, the property of extending under the blow of a hammer. For every metal there is a temperature of greatest malleability. The following is the order of malleability of the metals: Gold, silver, copper, platinum, iron, aluminum, tin, zinc, lead.

MALLEABLE GLASS. See GLASS, CHEMICAL PROPERTIES OF.

MALLECO, mal-yā'kō, formerly a province of Chile, now divided between Bio-bio and Cautin. Its area was 3,303 square miles, and its capital city was Angol The country is mountainous and well wooded in the eastern and western parts. About one-half of the population is composed of Indians of the Arauco tribe. Wheat is the staple agricultural product of the country. The other industries of importance are cattle raising, timber cutting and mining. The population was about 120,000.

MALLEE-BIRD, or MALEO, a name for the Australian mound-bird (q.v.), derived from a native language.

MALLERY, Garrick, American ethnologist: b. Wilkesbarre, Pa., April 23, 1831, d. Washington, D. C., Oct. 24, 1894 He was graduated from Yale College in 1850 and was admitted to the bar in 1853, he practised law in Philadelphia until 1861, when he enlisted and served through the war in the Federal army, attaining the rank of lieutenant-colonel He was executive officer of the Signal Service Bureau until 1876, when he was engaged in a geological survey in Dakota, and in 1879 was retired from the army and appointed chief of the bureau of ethnology. Among his books are 'A Calendar of the Dakota Nation' (1877); 'Israelite and Indian, a Parallel in Planes of Culture' (1889); 'Greeting by Gesture' (1891); 'Picture Writing of the American Indians' (1893), etc.

MALLESON, George Bruce, English soldier and historical writer: b London, May 8, 1825; d. there, Feb. 28, 1898. He was educated at Winchester College, and from 1842 till 1877 served in India, at first in the army, and subsequently in government posts. His chief work,

'History of the Indian Mutiny' (1878–80) commenced where the second volume of Kaye's 'Sepoy War' left off, and in 1890 there appeared a joint edition of the two histories in six volumes, the third volume of Kaye's work being omitted and a new sixth one added. Other works by him are 'The Mutiny of the Bengal Army' (1857); 'History of the French in India' (1868); 'Sketch of the Native States of India' (1875), 'Final French Struggles in India and Indian Seas' (1878), 'History of Afghanistan' (1879); 'The Decisive Battles of India' (1883), and lives of 'Clive'; 'Eugene of Savoy'; 'Prince Metternich'; 'Wellesley'; 'Dupleix', 'Akbar' and 'Warren Hastings.'

MALLET, John William, American chemist: b. Dublin, Ireland, Oct. 10, 1832; d. 1912. He was educated at Trinity College, Dublin, and at Gottingen, and emigrating to the United States in 1853 became assistant professor in chemistry at Amherst 1854-56 and later chemist to the United States geological survey of Alabama In 1856-60 he was professor of chemistry at the University of Alabama. He entered the service of the Confederacy and was paroled in 1865 as lieutenant-colonel of artillery. The chair of sciences at the University of Louisiana was occupied by him in 1865-68 and after 1868 he was professor of chemistry in the University of Virginia, becoming professor emeritus in 1908. He contributed valuable scientific articles to the leading chemical periodicals and published 'Cotton' (1862); 'Chemistry Applied to the Arts' (1868); 'Syllabus of a Course of Lectures on General Chemistry' (1890; rev. ed., 1901).

MALLET, a wooden hammer used in carpentry and also in the game of croquet $(q \ v)$ The gavel is a variety of mallet. Various small mallets are used by gold beaters, jewelers, dentists and other artisans.

MALIAN, ma-yan', Julien de, West Indian dramatist: b Le Moule, Guadeloupe, 1805; d. Paris, France, 1851. He gained wide reputation as a writer of comedies and dramas, many of which have been presented on the metropolitan stage. The most popular are "Two Roses" (1831), a historical drama of the civil wars in England; 'The Carpenter' (1831), a comedy; and 'The Wandering Jew' (1834).

MALLOCK, William Hurrell, English author b. Devonshire, 1849; d. April 2, 1923. He was graduated from Balliol College, Oxford, and won the Newdigate prize in 1872 He never entered a profession but devoted himself entirely to literary work. His philosophical and sociological writings include 'Is Life Worth Living?' (1879); 'Social Equality, a Study in a Missing Science' (1882), 'Atheism and the Value of Life' (1884); 'Property and Progress' (1884); 'Labour and the Popular Welfare' (1893); 'Studies of Contemporary Superstition' (1895); 'Classes and Masses' (1896); 'Aristocracy and Evolution' (1900); 'Religion as a Credible Doctrine' (1902); 'The Reconstruction of Belief' (1905); 'The Nation as a Business Firm,' and 'Social Reform' (1914). He also wrote several works of fiction, most of which deal with the same social and religious problems as the above works, including 'The New Republic' (1877), in which he introduced many

well-known contemporaries under thin diswell-known contemporaries under thin disguises; 'A Romance of the Nineteenth Century' (1881, new ed, 1894), 'The Old Order Changes' (1886), 'A Human Document' (1892); 'The Heart of Life' (1895), and 'The Individualist' (1899), and published two volumes of verse, 'The Veil of the Temple' (1904); a translation of Lucretius 'On Life and Death' (1878), and 'An Immoital Soul' (1908) His philosophical works deal with the (1908). His philosophical works deal with the fundamentals of religion, arguing for supernaturalism and aiming to show that science alone supplies no basis for religious belief; in his political and economic writings, he attacked the radical and socialistic theories and tendencies of the age. In 1916 he was awarded a Civil

List pension MALLOPHAGA, a name used for an extensive and varied assembly of feather-eating and hair-eating bugs, usually called lice. They are very small, oval, delicate and of swift motion; of light-brown color, some with shovel-shaped heads, others with horn-like appendages on the head. One delicate kind vexes the canary, gluing eggs to its feathers and in the cracks of its perch. Goniocotes is a large form, a tenth of an inch long, with bristled and shield-like head, and is one of the pests of domestic fowls. One species, colored with bands of yellow and brown, infests the turkey and the peacock Another great family, Liotheidæ, contains species which resemble white ants and preys upon the feathers of falcons and of wading birds. Gyropus infests guinea-pigs, mass-

ing thickly about their neck and ears.

MALLORY, Stephen Russell, American lawyer: b. Trinidad, West Indies, 1813; d. Pensacola, Fla, Nov. 9, 1873. His parents removed with him to the United States in 1820 and he was educated in Mobile and in Nazareth, Pa. He studied law and was admitted to the bar in 1839; he was United States senator 1851-57 and in 1861 entered the service of the Confederate States as secretary of a navy not in existence. He was arrested at the close of the war and held for 10 months, after which he returned to Pensacola and was until his death engaged in

law practice.

MALLOW, a genus of herbs (Malva), of the family Malvaceæ. The species, of which there are less than a score, are widely scattered and are characterized by angled, lobed or dissected leaves and solitary or clustered axillary flowers. They include four species cultivated in America and one very well-known weed, M. rotundifolia, popularly known among children as "cheese-plant" because of the shape of the fruits, which also suggested another popular name, "shirt-button plant." The plant is a perential of the pl name, snirt-outton piant. In a piant is a perennial, very persistent of life and rather difficult to eradicate except by constant clean cultivation. Musk-mallow (M. moschata) is cultivated for its large, showy pink or white flowers; M. alcea is also popular. M. crispa furnishes and the state of the stat nishes a useful fibre, as probably other species could be made to do. Its leaves are often used for garnishing but are not eaten. This species and M. sylvestris are frequently seen in old gardens and in their vicinity as escaped plants, but are not offered for sale by seedsmen. The name mallow is loosely applied to many plants of the mallow family, but not of the genus Malva; for instance, marsh-mallow (Althau

officinalis), rose-mallow (Hibiscus moscheutos) and Indian mallow (Abutilon abutilon); also, more loosely still, to unrelated plants, as Jew's mallow (Corchorus olitorius or C. capsularis). See Corchorus, Hollyhock, Hibiscus.

MALMAISON, mal-mā-zôn, a celebrated French château on the Seine, 10 miles west of Paris. It was the favorite residence of Josephine, wife of Napoleon I, and here she died. The château belonged to Richelieu, and was restored in 1861 by Napoleon III. In 1870 a sortie by Ducrot from Paris was repulsed here

by the Germans.

MALMEDY, a town in the province of Liége, Belgium. In 1814-15 the district was ceded to Prussia, and it became a German military base From it a number of strategic railway lines radiated toward Belgium. By the Treaty of Versailles, the districts of Malmédy and Eupen were ceded to Belgium, provided that their inhabitants expressed in writing, during the first six months after the treaty came into force, their desire to be joined to Belgium. This they did almost unanimously, and in September 1920 the transfer was recognized as definitive By a decree of March 6, 1925 Eupen and Malmédy became cantons in the province of Liege. Malmédy has important including tanning, dycing and papermaking establishments. Pop. about 5,000.

MALMESBURY, William of. See Wil-

LIAM OF MALMSBURY.

MALMESBURY, England, market town and municipal borough, Wiltshire, 94 miles west of London, on the Great Western Railway. It is built on a ridge of land almost surrounded by the river Avon and one of its small tributaries. Its site was chosen by a Scottish or Irish monk named Maildulphus for a hermitage in 635. He later gathered a colony of disciples about him, one of whom, Adhelm, became abbot of the abbey founded there, ruins of which still remain Athelstan rebuilt the monastery and is buried there. The town grew around the abbey, but was not incorporated until 1645, the charter then granted remaining in force until 1885. The modern town has a considerable agricultural trade, manufactures silk and pillow lace, and has tanneries and breweries. Two miles distant is the manor-house of Sir Lawrence Washington, and the church at Gardson where many members of the Washington family are buried. Pop. 2,500.

MALMIGNATTE, mål-mi-nyåt', a spider. See Latrodectus.

MALMÖ, mal'mė, Sweden, a seaport and the third largest town of the country, on the Sound, almost opposite Copenhagen, 17 miles distant, with which it has steam-ferry communication, a channel being maintained in winter by an ice-breaker. Malmo is a busy industrial centre with important manufactures, is the terminus of several railroads and is 384 miles by rail southwest of Stockholm. The town and its harbor have been considerably improved and producing the second on contouring the second of the seco modernized, and an extensive export and import trade is carried on. Malmö dates from the 12th century, but until 1500 it was little more than a poor fishing village. It again suffered a period of decline but revived after the improvements to the bother effected after the provements to the harbor effected in 1775. Pop. 118,000. It has an interesting city hall, Saint Peter's Gothic Church and an ancient castle. The industries include iron works and foundries, manufacture of railroad cars, shoes,

gloves, tobacco, chocolate, etc.

MÁLMSEY, măm'zĭ or mălm'sĭ, a sweet wine, made from a grape grown on rocky ground, in Madeira, exposed to the full influ-ence of the sun, and not gathered until partially withered.

MALOLOS, mä-lo'los, Philippines, a pueblo and the capital of the province of Bulacán, Luzon, situated at the head of one of the inlets of the Pampanga River delta, five miles northwest of Bulacán, the former capital It is a telegraph and military station, is near a station of the Manila-Dagupan Railroad and is the centre of an important trade. It is in a region which was a stronghold of the insurgents, and immediately after the close of the Spanish war was made the capital of the insurgent govern-ment. Rice is extensively cultivated in the vicinity. Pop. 12,575

MALON, mal'on, Benoît, French Socialist: b. near Sainte-Etienne in the department of Loire, June 23, 1841; d. Asnières, Sept 13, 1893. He early entered upon a journalistic career and his activities in behalf of Socialistic agitations caused his enforced absence from France for a time preceding 1880. He then founded the Revue Socialiste which he edited until his He attained considerable influence through the breadth of his teachings, which advocated the necessity for an inclusion of certain high religious, ethical and moral considerations with the socialistic principles of government. Author of 'L'Internationale, son histoire et ses principes' (1872); 'Histoire du Socialisme et des prolétaires' (1881–84); 'Le socialisme intégral' (1890–91), etc.

MALONE, ma'loni, Edmund, Irish Shakes-

pearean scholar: b Dublin, Oct. 4, 1741, d London, April 25, 1812. He was educated at Trinity College, Dublin, and was called to the Irish bar in 1767, but henceforth devoted himself entirely to literary pursuits. His most important and permanent critical works are 'Attempt to Ascertain the Order in Which the Plays of Shakespeare Were Written' (1778), which still carries authority; his edition of the poet in 10 volumes; and the edition known as the Third Variorum, which was prepared after his death by James Boswell, the younger, out of material left by the critic, and published in 21 volumes. This last is still the best of all complete critical editions. He also published (Remarks on the Rowley (Chatterton) Controversy'; 'An Inquiry into the Ireland Shakespearian Forgeries'; and biographical memoirs of Sir Joshua Reynolds, Dryden, W. Gerard Hamilton, etc. Consult Prior, James, 'Life of Edmund Malone' (London 1864); Leslie and Taylor, 'Life of Sir Joshua Reynolds' (ib. 1865) and Boswell. Tames. 'Life of Johnson.'

1865) and Boswell, James, 'Life of Johnson,' edited by G. B. Hill (Oxford 1887).

MALONE, Walter, American poet and jurist: b. Desoto County, Miss., Feb. 10, 1866; d. Memphis, May 18, 1915. He was graduated at the University of Mississippi and subsequently engaged in the practice of law and in literary. engaged in the practice of law and in literary work. He contributed to the periodicals of the day and published 'Claribel and other poems' (1882); 'The Outcast' (1886); 'Nar-cissus' (1893); 'Dusk and Dawn' (1895); 'December and June' (1896); 'Coming of the King' (1897); 'Songs of North and South' (1900), 'Poems' (1904), 'Songs of East and West' (1906); 'Hernando DeSoto,' an epic

poem highly praised (1914).

On March 29, 1905, on petition of practically all members of the Memphis bar, he was appointed judge of the Circuit Court of Shelby County and held the position until his death. An association composed of members of many States has been formed to erect a bronze portrait statue to Walter Malone in the principal park of Memphis, while another association has for its object to have his "Opportunity" cast into a bronze tablet to be erected in Court square, in the heart of Memphis.

MALONE, N Y, village and Franklin County seat, alt. 730 feet; on the Salmon River; and on the New York Central, and the Rutland railroads, 167m. NE of Utica. It has an airport Situated 12 miles from the boundary between the United States and Canada, Malone is a port of entry for the seventh customs district.

Lying in the northern foothills of the Adırondack Mountains, the town is surrounded by a fertile agricultural area raising hops, hay, potatoes, and has dairy products Considerable lumbering is also carried on. A large tract of woodland near by was burned over in the early 1900's, and, as a part of the Adirondack State Park, has been reforested. Mineral resources of the region remain to be developed Industrially, Malone has had a varied list of products. Paper milling was at one time the chief dependence of the village; now other manufactures include shoes, slippers and moccasins, bronze and aluminum powder, and woolen clothing. There are lumber mills, tanneries, foundry and machine shops, and railroad repair shops. Hydroelectric plants line the river. The mills and lumber camps employ many French-Canadians In most of the homes in the village, both English and French are spoken. This French-Canadian element is an important factor in the industrial population of northern New York, as in northern New England.

Malone has good schools, parks, playgrounds, and facilities for recreation. The northern New York Institution for Deaf Mutes is located here The Wead Library is handsomely housed, and the county historical society maintains a library and a museum. There are many points of historical interest. The home of William Almon Wheeler (q.v.) is now the Elks Club. The home of the founder of the village, Richard Harison, was used during the War of 1812 as headquarters for Gen. James Wilkinson (q.v.); this was in 1813, when Wilkinson was ordered to the frontier and failed to carry out plans for a campaign in Canada. Arsenal Green was a parade ground in the War of 1812 and was occupied by British troops during the brief period when the village was held by them The federal building, the courthouse, and old Franklin Academy are notable.

Malone was first settled in 1802 by a group of Vermonters, one of whom selected the name in honor of Edmund Malone (q.v.), an Irish Shakespearean scholar. The village was incorporated in 1833. From its earliest days Malone

had a strong Irish element, and in 1866 the village was selected by the Fenians (q.v.) as a base for an invasion of Canada. They did ac-

tually cross the border, but, after an encounter with Canadian troops, they returned to Malone and disbanded The village is governed by a mayor and council Pop (1930) 8,657; (1940) 8,743

MALOO CLIMBER. See BAUHINIA.

MALORY, Sir Thomas, author of the English prose romance "Morte d'Arthur." The work was finished in the ninth year of Edward IV's reign, 1470, and published by Caxton in black-letter folio, in 1485. Little is known of the author, he may have been a priest, Caxton calls him "a servant of Jesus both day and night," and priests frequently were accorded the title "Sir." Probably he was a Welshman. See Arthurian Romances; Morte D'Arthur; Grail, The Holy, Lancelot of the Lake; Merlin; Tristan.

MALOT, ma-1ō, Hector Henri, French novelist b. La Bouille, near Rouen, France, May 20, 1830; d. Vincennes, July 18, 1907 He studied law, but abandoned it for a literary career, and in 1859 issued the first of a long series of successful novels. He was for a time newspaper correspondent in London, and literary critic of L'Opinon Nationale. He wrote "Victimes d'amour" (1859); "Sans famille," published in English as "No Relations" (1878); "Conscience" (1888); "Complices" (1893); "En famille" (1893); "Amours de jeune, Amours de vieux" (1896); an autobiography, "Le Roman de mes Romans" (1896).

MALPIGHI, mal-pē'gā Marie "Marie Manatomiet" la source de vieux" (1896).

MALPIGHI, mal-pē'gē, Marcello, Italian anatomist: b. Crevalcuore, Italy, March 10, 1628; d. Rome, Nov. 29, 1694 He received a medical education in Bologna and was granted a doctor's degree in 1653 In 1656 he became professor of medicine at Pisa, where he formed a friendship with the mathematician Borelli, who encourged him to proceed with researches in anatomy. His health failing he returned to Bologna and continued his investigations, which resulted in discoveries which established facts undisputed in the modern world of science and placed the world's knowledge of physiology on a new footing; his researches in botany and entomology were highly important. In 1691 he was summoned to Rome as first physician to Innocent XII, in which office he died. He published numerous scientific works of great value, a complete edition of which was published in Venice 1743. The principal of these are "Observationes Anatomicæ" (1661) and "Epistolæ Anatomicæ" (1665).

MALPLAQUET, māl-plā-kā, Battle of, the bloodiest in the war of the Spanish Succession, gained by Marlborough and Eugène, the commanders of the allies, against the French under Villars, Sept. 11, 1709. The French lost 10,000; the allies more than 20,000. Malplaquet is a village in the department of the Nord, near the Belgium frontier, 20 miles east of Valenciennes. After the victory there the allied armies soon took Mons and Douai

MALSTROM. See MAELSTROM.

MALT AND MALTING. See BREWING AND MALTING.

MALSTATT-BURBACH, Prussia, town in the Rhine province, on the Saar and opposite Saarbrücken. It is situated in a coal-mining

district and is almost entirely given over to factories and workmen's dwellings. There are manufactories of iron, steel and cement, machinery, boilers and safes. It has a large wharf for handling the exports of coal. Malstatt received municipal rights in 1321, but these were later surrendered. The town began to grow in middle of the 19th century and in 1874 it joined with Burbach to form a city. Pop about 38,554.

MALT REFUSE, MALT SPROUTS. See Nutrition of Farm Animals.

MALTA, mâl'ta, an island in the Mediterranean, belonging to Great Britain, with its dependencies, Gozo, Comino and Cominetto, forming the elevated portions of the plateau that extends northwestward to Sicily, 62 miles, and southward to Africa, 197 miles, and divides the Mediterranean into two basins. The Maltese group has a total area of 122 square miles, of which 95 square miles belong to Malta Malta is of irregular oval shape, 17 miles long, with a central breadth of nine miles, its greatest eleva-tion is over 750 feet. It is of limestone formation, and is deeply indented on all sides except the south, where the coast forms a continuous and almost unbroken line. Of great strategical importance, it is very strongly fortified, especially Baletta, the capital, which is the head-quarters of the British Mediterranean fleet and the principal naval and mercantile coaling station in the Mediterranean. During the World War of 1914-18 it was one of the most important of British naval stations and in the war that began in 1939 it was repeatedly bombed by German and Italian aircraft. It served as a British air base for attacks on Italian Libya and Sicilian air fields. The climate is sultry in summer and somewhat enervating when under the influence of the humid sirocco blowing from Africa, but generally is mild and healthful There are only a few small streams, but the springs are so numerous and copious that no deficiency of water is felt, and since 1880 an extensive system of waterworks has greatly improved sanitary conditions Malta has a bare, stony appearance owing to the absence of trees. The soil is thin but re-markably fertile; and its fertility is increased by the skillful cultivation and the diligent toil of the mhabitants Large crops of wheat and potatoes are raised, early varieties of the latter being largely exported to England; maize, barley, cotton, cloves, oranges, figs, grapes, carob beans and peaches and other fruits are also grown. Filigree ornaments and a little cotton are manufactured. Sheep and good to the cotton are manufactured. cotton are manufactured. Sheep and goats are kept, with smaller numbers of cattle, mules, asses and horses. The language of the people is a dialect of Semitic origin derived from the Carthaginian and Arabic tongues, with a strong admixture of Italian. The native population believes themselves to be of Phænician descent. English and Maltese are the official languages. English is used for all administrative purposes; Maltese is used in the courts of law, having been substituted for Italian in 1934. The executive head of Malta is a governor, who is also commander-in-chief of the island. On Feb. 26, 1939, Malta was granted a new constitution under letters patent dated February 14. It provides for a Council of Government, composed of eight official members, two unofficial members nominated by the governor, and 10 elected mem-

bers. The governor presides over the Council, with a casting vote but no original vote Ecclesiastics are precluded from membership. Malta is of great historical, archæological and architectural interest. It was in St Paul's Bay that the Apostle Paul is now generally believed to have been shipwrecked in 58 AD (Acts xxvii and xxviii) The island was held in turn by the Phœnicians, the Greeks, the Carthaginians, and the Romans It was conquered by the Arabs in 870 AD, and was attached to Sicily from 1090 until 1530, when the Emperor Charles V turned it over to the Knights of St. John, who distinguished themselves during succeeding centuries by their bold defense of Christianity against Moslemism, especially during the siege of 1565. As the Knights of St John of Malta they became famous throughout the civilized world. They ruled the island until they were dispersed by Napoleon in 1798. Thereafter the Maltese rebelled against the French, and aided Great Britain when her fleet blockaded the island, 1798–1800 At the request of the inhabitants Britain made the island a protectorate, and it was formally annexed to the Biitish Crown by the Treaty of Paris in 1814 It is one of the most important ports of call in the world. Consult Gatt Rutter, J, "Malta" (1936); Porter, W, "A History of the Knights of Malta" (1883); Zammit, Th., "Malta The Islands and Their History" (1926).

MALTA FEVER UNDULANT orFEVER, a disease closely related to, if not identical with, the livestock malady known as Bang's disease or infectious abortion, and first described by Hippocrates nearly 2,300 years ago. Highly prevalent in the Mediterranean area, especially on the Island of Malta, it has spread from there throughout the world. Variously known as Malta fever, Mediterranean fever, Neapolitan fever, etc, more recently it was given the name "Undulant Fever" because the attacks come in waves or undulations. The symptoms are characteristic, the fever being accompanied by intense pain, enlargement of the spleen, swelling of the joints, excessive perspiration, etc. The fever may last for but a few days, a few weeks, or it may continue for months, then disappear only to reappear after an indefinite period. The patient may be ill for two or three years before any definite improvement is noted The mortality rate, however, is low. The causative agent was isolated by Dr. David Bruce, a British army surgeon, in 1887, from human beings who had succumbed to the disease on the Island of Malta He called the germ Micrococus melitensis. Later it was discovered that the germ invaded goats, and that humans commonly acquired it by drinking the milk of infected goats. It was brought to the United States a number of years ago when Southwestern ranchers imported large numbers of goats from Malta. It has since been learned that the germ invades cattle and swine, and most of the cases developing in the United States have been traced to the drinking of milk of infected cows. Professor Bang isolated the germ of the abortion disease in 1897, and in 1918 Miss Alice C Evans of the U. S. Department of Agriculture discovered the similarity or close relationship between the germs isolated by Bruce and by Bang. See also Bang's DisMALTA, Knights of. See JOHN, ORDER OF

MALTE-BRUN, mal'tě-broon (Fr. maltbrun), Conrad (properly Malthe Brunn), Danish geographer b. Thisted, Jutland, Aug 12, 1775, d. Paris, Dec. 14, 1826 He devoted himself to literature and politics in Copenhagen, but having given offense by writing in favor of the liberty of the press and the enfranchisement of the peasants, was banished to Sweden in 1800. He went later to Paris, where he became famous as a geographer. He edited the foreign political department of the Journal des Debats, but is best known for his "Summary of Universal Geography" (8 vols, 1810-29) first six volumes only were completed by Malte-Brun. Among his other works are "Ancient Brun. Among his other works are "Ancient and Modern Poland"; "History of Travel," and "Mathematical, Physical and Political Geography"

MALTESE (mâl-tēs' or -tēz') CROSS.

See Cross

MALTESE DOG. See Dog.

MALTHA, (1) according to Pliny, a name used for an inflammable mud which flowed from a pool at Samosata, Commagene, North Syria, and resembled naphtha (2) A mixture of wax and pitch for caulking ships; mineral tar is another name for maltha, which is found oozing from rocks in certain localities, particu-

larly in California

MALTHUS, Thomas Robert, English political economist b near Guildford, Surrey, Feb 14, 1766, d. Bath, Dec. 29, 1834. He studied theology at Cambridge and was ordained in the Church of England, continuing to pursue his profession as a teacher while holding a small living in Surrey. In 1805 he was appointed professor of history and political economy at Haileybury College. In his famous "Essay on the Principles of Population" he propounded (1798) what is known as the Malthusian Doctrine, namely, that the increase of population advances at a geometrical, the increase of the means of life at an arithmetical, ratio; that this condition of things renders the condition of the poor more and more hopeless, that unless famine or war interfere to diminish population the means of life will eventually prove inadequate, that discouragement of early and improvident marriages and the cultivation of self-restraint must be employed to avert the danger These positions have been the subject of long and widespread discussion. His other writings in-clude "An Inquiry into the Nature and Progress of Rent" (1815), "Principles of Political Econof Rent" (1815), "Principles of Political Economy" (1826); "Definitions in Political Economy" (1827). Consult Bonar, "Malthus and His Work" (1885); Soetbeer, "Die Stellung der Sozialisten zur malthusischen Bevölkerungslehre" (1886); Molinari, "Malthus, Essai sur le Principe de Population" (1889); Cossa, "Il principio di populazion di T. R. Malthus" (1895). See Economics.

MALUS, Etienne Louis, ā-tē-ĕn 100-ē mälus, French physicist and military engineer: b. Paris, June 23, 1775, d. there, Feb. 23, 1812. He was educated at the École Polytechnique, and upon leaving the school received a captain's commission in the corps of engineers, and served during the campaign of 1797 with the army of the Sambre and Meuse. Subsequently he participated in the campaign in Egypt, and in 1804 superintended the construction of fortifications at Antwerp and Strassburg Whatever time could be spared from his professional labors was devoted to scientific pursuits. His chief publications consist of a mathematical 'Traité d'Optique,' first published in the 'Mémoires présentés à l'Institut' in 1810, in which he promulgated some valuable discoveries respecting the refraction of light in transparent media; and the 'Theory of Double Refraction' (Mémoires présentés à l'Institut, Vol. II), containing an account of his discoveries respecting the polarization of light, which consisted in showing that light may acquire properties identical with either of two rays yielded by refraction through Iceland spar by the process of simple reflection at a particular angle from any transparent body. This discovery gained for its author his election to the Institute and the biennial medal of the Royal Society of London. He also published an 'Essay on the Measurement of the Refractive Force of Opaque Bodies.'

MALVACEÆ, a family of flowering plants, the mallows and their allies, in the order Columniferæ, with the calyx gamosepalous, petals contorted in a bud, stamens numerous, monadelphous; anthers extrorse, monothecious; pollen-grains spiny. They are herbaceous or woody plants, mucilaginous in their juices, and usually densely hairy, especially when young. The leaves are palmately nerved and frequently deeply five-lobed. The flowers are large, funnel-shaped, conspicuously and beautifully colored, attracting the aid of insects in fertilization. The fruit is schizocarpous. This family contains many important genera and species of plants elsewhere described, such as the mallows (Malva, Lavatera, etc.), hollyhocks (Althæa), cotton-plants (Gossypum), the rose-mallows (Hibiscus), etc. About 60 genera and 900 species are accredited to this family by systematic botanists.

MALVERN, măl-vêrn, Ark., town and Hot Spring County seat; alt. 315 feet; 43m. SW. of Little Rock, and 22m. SE of Hot Springs, on Missouri Pacific; and Rock Island railroads It is in a timber, mineral, and farm area, producing lumber, cotton, clays, barite, titanium ore and marble. It has a titanium ore processing plant, shoe factory, and wood products mills. Incorporated in 1872. Pop. (1940) 5,290.

MALVERN, mâl'vern, Great, England, a fashionable inland watering-place in Worcestershire, on the east side of the Malvern Hills, at the foot of the Worcestershire Beacon, 1,395 feet high, the summit of which commands magnificent views A restored 11th century priory church and Malvern College are the chief edifices. Malvern is widely celebrated and greatly frequented owing to its salubrious climate and the efficacy of its mineral springs Pop. of urban district about 17,000

MALVERN HILL, Battle of. After the close of the battle of Glendale (q.v.), June 30, 1862, the Army of the Potomac was put in position on Malvern Hill, an elevated open plateau on the left bank of James River, 60 feet high, and about 1½ miles by ½ mile in area. On this plateau the army was disposed in a large arc, both flanks resting on the river and protected by gunboats. Porter's Fifth corps was on the left, Couch's division of Keyes' corps

on the right of Porter, Heintzelman's two divisions-Kearny and Hooker-on the right of Couch, Sumner's corps on the right of Heintzelman, and Franklin's corps on the right of Sumner. Peck's division of Keyes' corps was on the right of Franklin and was the extreme right of the army, and it and the left of Poiter's line stood back to back. There were numerous batteries of artillery along and in rear of the line. The position was a very strong one the Confederate D. H. Hill says: "Tier after tier of batteries were grimly visible on the plateau rising in the form of an amphitheatre." The approach to the position was The approach to the position was over 400 to 500 yards of open ground swept by artillery fire. When it was discovered early in the morning of July 1 that McClellan had fallen back from Glendale during the night, Lee gave orders for immediate pursuit Jackson marched by the Willis road, and when in sight of Malvern Hill he formed line, with Whiting's division on his left and D. H. Hill's on his right, one of Ewell's brigades occupying the interval The rest of Ewell's division and Jackson's own division were held in reserve. Magruder was directed to take position on Jackson's right, but before his arrival two of Huger's brigades came up and were placed next to Hill The Confederates felt the Union lines with infantry and artillery, and when Magruder came up, about 2 PM. Huger's two brigades—Armistead and Wright—with four batteries, were ordered forward. The batteries, as they emerged in succession from the woods, were promptly knocked to pieces by the fire of over 60 guns brought to bear upon them, and the two brigades were repulsed with loss This attack fell upon the right of Porter and left of Couch, and the latter was now reinforced by Caldwell's brigade of Sumner's corps No serious advance had been made on other parts of the line, but Hill had suffered severely from artillery fire in getting his troops in position opposite Couch's right At 5 30 P.M. Magruder assaulted Porter's line and the left of Couch with the five brigades of Armistead, Cobb, Wright, Mahone and Barksdale. All were met by such a terrific fire of artillery and musketry, which swept the slope of the hill, that they could make no headway, though gaining temporary advantages, and fell back with great loss Toombs', G. T. Anderson's and Ransom's brigades were now ordered in; Toombs got lost in the thick woods; Anderson and Ransom shared the fate of those preceding them, and fell back. Magruder's fight ended before dark. While Magruder was thus engaged with Porter and the left of Couch, D H Hill, on his left, advanced against Couch's right, which as the action progressed was reinforced. which, as the action progressed, was reinforced by Caldwell's brigade, three regiments of Hooker's division under Sickles and some of Kearny's division. Hill's five brigades were commanded by Generals Garland and Ripley and Cols. J. B. Gordon, A. H. Colquitt and C. C. Tew. The slope to Couch's line was about 800 yards, without cover, and the advance directly in the face of guns on the slope and bristling on the summit, from which burst forth such a terrific fire of shell and canister that Hill's brigades withered under it. Toombs' brigade was picked up and sent to their support, but the six brigades with the same but the same in the same but the six brigades were hurled back, some in great disorder after the loss of half their men.

Later in the evening Taylor's brigade of Ewell's division, on Hill's left, moved against the left of Kearny's division, and was repulsed by artillery fire alone. Half an hour after Hill had been disastrously repulsed and his troops scattered, McLaw's division of two brigades—Semmes and Kershaw - came up and assaulted Porter's right. Semmes made some headway up the slope, but was met by the 69th and 88th New York of Meagher's brigade, which Sumner had sent to Porter's assistance, and was repulsed after a hand-to-hand encounter. Kershaw, on Semmes' left, was likewise repulsed, and his repulse at twilight marked the close of the battle, but it was 9 o'clock before the firing ceased and quiet settled down on the bloody field. Sixteen Confederate brigades had heroically thrown themselves against the Union left, but were repulsed by the artillery and nine brigades. Advanced regiments were forced back, but generally recovered ground; batteries or parts of batteries were withdrawn, but again run forward; yet "never for an instant was the Union line broken or the guns in danger" The Confederate loss was over 5,500; Jackson's four divisions had 2,301 killed, wounded and missing; Magruder and Huger about 2,900 The Union loss was less than 2,000 Consult 'Official Records' (Vol XI), Webb, 'The Peninsula'; 'McClellan's Own Story', Allan, 'History of the Army of Northern Virginia'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. II)

E A CARMAN.

MALVERN (mâl'vern) HILLS, England,
a range of picturesque hills on the borders of
Worcester and Hereford shires It extends
north and south for about nine miles, and attains an altitude of 1,395 feet in the Worcestershire Beacon.

MAMANUA, ma-ma'noo-a, a Negrito people of the Philippines living in the interior of Surigdo Penansula, island of Mindanao. Large numbers of them have been converted to Christianity by the Jesuit missionanes

MAMARONECK, ma-măr'ō-něk, N. Y, village in Westchester County, alt. 47 feet, on Long Island Sound and the New York, New Haven and Hartford Railroad, 20m. E by rail from Grand Central Station in New York. (Part of the village, along with the village of Larchmont, is included in the town of Mamaroneck) The section is principally residential, but there are some small local industries. There is a public library. Notable buildings are the library, the municipal building, and the postoffice. The village's name is Indian, and is variously said to mean "He assembles the people" and "Where the salt water meets the fresh" Settled in the 1650's, the village was incorporated in 1895 It has a mayor and council, and a village manager. Pop. (1930) 11,766; (1940) 13,034.

MAMARONECK RIVER. See Bound-ARIES OF THE UNITED STATES

MAMBAJAO, măm-bà'how, a town of the province of Misamis, Mindanao, situated on the northwestern coast of Camiguin Island, which lies off the northeast coast of Mindanao Pop. 14.500

MAMBER, a widely diffused colloquial name, for the common wild goat (Capra agagrus) of southwestern Asia. See GoAT.

MAMBUSAO, mam-boo'sa-ō, Philippines, a pueblo of the province of Cápiz, island of Panay, on the Cápiz River, opposite Ibajay and 17 miles southwest of Cápiz, the provincial capital. Pop 8,300.

MAMELUKES, măm'e-lūks, MAM-LOUKS, or MAMALUKES (from the Arabic memalik, a slave), in Egypt, slaves from the Caucasian countries, who from menial offices; were advanced to dignities of state When Genghis-Khan made himself master of the greatest part of Asia in the 13th century, and carried vast numbers of the inhabitants into slavery, Nedjmeddin (Malek Salah), sultan of Egypt, bought 12,000 of them, including natives of Circassia luit, abid. That of Carcassia, but chiefly Turks, from Capchak (Kipzak), had them instructed in the military exercises and formed a regular corps of them They soon exhibited a spirit of insubordination and rebellion Under his successor they interfered in the government, assassinated the sultan, Turan Shah, and in 1254 appointed Ibegh, one of their own number, sultan of Egypt. The dominion of the Mamelukes in Egypt continued 263 years. During this period they made some important conquests, and in 1291 they drove the Franks entirely out of the East. From the middle of the 18th century the number and wealth of the Mamelukes gave them such a superiority over the Turks in Egypt that the pasha appointed by the Porte was obliged to conform entirely to their wishes. This superiority was owing, principally, to Ali Bey, who ruled with unlimited power from 1766 to 1773, when he was assassinated. The Mameluke beys, especially Murad Bey, played an important part at the time of the French invasion The Mamelukes, who were scattered throughout Egypt, and estimated at 10,000 or 12,000 men, maintained their numbers, principally by slaves brought to Cairo from the regions lying between the Black and Caspian seas These were compelled to embrace the Mohammedan faith, and were all educated as soldiers. After a time they obtained a share in the government, and some of them even became beys, for none but Mamelukes were capable of holding this office. They formed a fine body of cavalry, and attacked the French, when they landed in Egypt, with the greatest fury; but they were unable to withstand the European artillery, and many of them soon joined the French. The pasha of Egypt, Mehemet Alı, destroyed the Mameluke beys 1 March 1811, by a perfidious stratagem, and immediately afterward ordered a general massacre of the Mamelukes in every province of Egypt. Some hundreds managed to escape into Lower Nubia, where they built a small town, and endeavored to keep up their force by disci-plining negroes in their peculiar tactics. They did not succeed, however, and shortly afterward dispersed. (See Egypt) Consult Makrizi, 'History of the Mameluke Sultans,' translated by Quatremère (3 vols., Paris 1837-41) and Muir, William, 'The Mameluke or Slave Dynasty of Egypt, 1260-1517' (New York 1906).

MAMEY, or MAMMEE-APPLE. See MAMMEE APPLE

MAMEY SAPOTE, a large tree (Calocarpum mammosum) of the family Sapotaceæ, native of tropical America. The leaves are large, obovate, glabrous, the flowers small and

inconspicuous and the fruit globose or eggshaped, rusty brown, and three to seven inches long, with a single large seed. The fruit is very popular in the tropics, especially in Cuba, and is sometimes shipped to the United States. It is eaten fresh, or used for sherbets or marmalade The tree is grown in Florida and California, but so far not very successfully.

MAMMALIA. See Mammals.

MAMMALS, a class of animals, known also as beasts, or quadrupeds, the highest of the vertebrate group in the sense that it comprises forms whose organization is on the whole the most efficient on account of the complexity, or perfection, of the various organs and parts. The diagnostic character of the class is the possession of cutaneous glands, which secrete a complex fluid, called milk, for the nourishment of the young. The lower jaw articulates directly with the cranium, without the mediation of a quadrate bone. The occipital condyles, two in number, form part of the exoccipitals. The internal ear contains a series of three or four separate small bones, which are concerned in audition. The heart is four-chambered, with two auricles and two ventricles, a single left aortic arch; blood warm, red blood discs, not nucleated. A muscular diaphragm separates the heart and lungs from the abdominal cavity. With few exceptions, mammals are clothed with hair, a special outgrowth of the epidermis, and even in these exceptional cases isolated hairs are found at some stage of their life.

Mammals as a class are extremely diversified in size, appearance and habits. The structure of some is modified for a purely aquatic life, of others for burrowing in the earth, for lying, for leaping, for running, etc. Some live entirely in the sea, others pass their lives in the treetops and others in subterranean caverns,

which they excavate.

All mammals possess limbs, which are normally four in number, but the hind pair is suppressed in the whales and sea-cows. The limbs assume the form of legs for terrestrial progression, wings for flight or paddles for swimming. The class includes man, and the majority of the animals most useful to man, such as the horse, ox, sheep, goat, dog, cat, etc. It includes also the whales, the largest of existing animals. About 600 genera and 5,000 species of mammals (exclusive of fossil forms) are known, of which about 200 genera and 1,200 species occur in North America, north of Panama.

Integuments.— The skin of mammals consists of two principal layers, a superficial one, called the epidermis or cuticle, and a deeper layer, the dermis or corium. The epidermis is again divided into two layers, an external horny layer and a deeper one, called the Malpighian layer. The epidermis is usually quite smooth, and is beset with hairs which are a special outgrowth of this part of the integument peculiar to the class. The cetacea are without hairs, except a few about the mouth. In the pangolins, the epidermis develops large scales which cover the greater part of the body. Epidermic scales of smaller size are found on the tails of various todents, insectivores and marsupials. The horns of ruminants, the nasal horn of the rhinoceros and all claws, nails and hoofs are also epidermic structures.

The dermis or corium is generally thicker

than the epidermis and contains blood-vesses, tactile nerve endings, sweat glands which open on the surface of the body and fatty tissue. In the whales and seals the fat cells are enormously developed immediately below the dermis and constitute the "blubber" In the armadillos bony plates occur in the dermis, forming a carapace or shell. They are covered by horny sheaths. The presence of small hard tubercles in the skin of certain porpoises gives giound for the belief that the ancestors of the cetacea were covered with a bony aimor, somewhat like that of the armadillos.

Hair.—True hairs are found only on mammals. They are simple epidermic structures growing from papillæ sunk in the dermis. They consist of central cellular pith, encased in a horny sheath. In some mammals, the sheath is rough, and the hair is then capable of being matted together to form "felt." In the majority of mammals the hairy covering consists of coarse long hairs and fine short hairs intermingled, forming the fur. In the porcupines the coarse hairs assume the form of large suff spines, or quills; in the hogs they are smaller and more flexible, forming bristles. The hairy covering is usually shed once or twice annually, except in the case of man and of the manes and tails of such ungulates as the horse, the hairs of which may persist throughout life.

The majority of mammals have a number of large, long hairs, or vibrissæ, arranged in a definite fashion about the mouth, eyes and ears, which serve to a certain degree as tactile organs. In deer and some other ruminants the hairs consist mainly of the cellular pith and

hence are easily broken.

The color of mammals is chiefly due to the pigments contained in the hair, which belong to the class known as melanins Black, white and brown in various mixtures and shades are the commonest colors. The coloration is chiefly protective, but some such sharp contrasts of black and white as those of the skunks are thought to be warning colors, and the clear white of the under side of the tail of deer, certain hares, etc., to be directive, or distin-

guishing, marks for the young.

Skeleton.—The skeleton consists of an axial portion, comprising the skull, the backbone or vertebral column, the ribs and the sternum; and an appendicular portion or the skeleton of the limbs. In the skull the bones are bound firmly together by the overlapping or interdigitation of the edges, except the lower jaw, the ossicles of the internal ear and the hyoid, or tongue, bones. In adults most of the sutures are usually obliterated The snout or rostrum consists of the premaxillary, maxillary, palatine and pterygoid bones below and on the sides, and the nasals above, while within are the median vomer and the ethmoid bones. The rostrum abuts against the brain-case or cranium, which is vaulted, and comprises three segments, an anterior one, consisting of the presphenoid, orbito-sphenoids and frontal; a middle segment, consisting of the basisphenoid, alisphenoids, squamosals and parietals; and a posterior segment, consisting of the basi-occipital, exoccipitals and supra-occipital. The exoccipitals bear the two condyles for articulation with the vertebral column. At the base of the skull, between the occipital and squamosal, are

the periotic pones, containing the organ of hearing or internal ear, and the tympanics, which form the bony walls of the orifice of the ear. The tympanics are greatly expanded in whales and some other mammals, forming shell-shaped bullæ.

The vertebral column comprises five sections, the cervical, dorsal (or thoracic), lumbar, sacral and caudal. The cervical vertebræ are seven in number in all mammals, whatever the length of the neck, the only exceptions being the manatees, which have six, and the sloths, which have six, eight or nine In certain whales, the majority of porpoises and some rodents, the cervicals are more or less united; in the right whales they form a single bony mass. The dorsals vary in number from 9 to 22. Articulated with each is a pair of ribs. The ribs terminate below in cartilages, which sometimes ossify, forming what are called "sternal ribs" By means of these cartilages the anterior pairs of ribs are connected with the breastbone or sternum, which may consist of a single piece, as in the whalebone whales, or of several seg-ments arranged longitudinally. The posterior pairs of ribs are sometimes called "floating ribs" because their cartilages do not meet the sternum, but are attached to those of the more anterior pairs, or are quite free. The lumbar vertebræ follow the dorsals and are without ribs. In number they vary from 2 to 30 in different forms. The number of dorsal and lumbar vertebræ combined is quite constantly 23 in the odd-toed ungulates (horse, rhinoceros, tapir, etc.), 19 in even-toed ungulates (deer, ox, sheep, etc.), and 20 or 21 in carnivores and most insectivores. Man, the higher apes and many bats have 17. Following the lumbars is the sacrum, consisting usually of three vertebræ joined together and connected with the pelvis region is not distinguishable in the whales and sea-cows, which lack hind limbs The caudals, or tail-vertebræ, complete the column. In man and in certain apes and bats they are three in number and rudimentary, but as many as 46 are present in the long-tailed pangolins. In the intervals between the anterior caudals below are situated small V-shaped bones, called chevrons, whose chief function is to protect the larger blood-vessels of the tail. They are especially well developed in the whales and eden-

In many groups of mammals the anterior limbs are connected with the axial portion of the skeleton through the pectoral girdle, consisting of the shoulder blades, or scapulæ, and the collar-bones or clavicles. The scapula is not attached directly to the vertebral column, but its acromion process is joined to the anterior end of the breastbone, or sternum, by means of the clavicle. Clavicles are wanting in all seals, whales, sea-cows and ungulates, and are rudimentary or wanting in various representatives of several other groups. They are present in man and, with one or two exceptions, in all monkeys, bats, insectivores and marsupials. The upper-arm bone, or humerus, articulates superiorly with the scapula, and below with the two bones of the fore-arm, the radius and ulna. In the majority of mammals the radius, or outer bone, is permanently crossed over the ulna at the lower end, as is especially well seen in the elephants. In man and a few other forms the radius can be rotated. Following the fore-arm is the wrist or carpus, consisting of three rows of small bones, which, however, are variously united in different forms; and finally the digits, which are normally five in number, each consisting when fully developed of a metacarpal bone and three other bones, or occasionally more, called phalanges, though the first digit, or thumb, usually has but three in all. In man and apes the thumb is opposable to the other digits many mammals this digit and also the fifth are greatly reduced, or entirely wanting In the ruminants, such as the pig, ox, deer, camel, etc, the first digit is wanting, and the second and fifth are reduced in size, or entirely lacking, while the third and fourth are equal in length and well developed. In the odd-toed ungulates, such as the horse, rhinoceros, tapir, etc., the third digit is longest, the others being reduced in length, rudimentary or wanting ungulates the metacarpals are usually much elongated and in such ruminants as the deer, ox, etc, are united, forming what is known as a "cannonbone" The cetacea are peculiar in that the bones of the fore-limb are not movably articulated and that the phalanges of the middle digits often greatly exceed three. In bats the phalanges are very greatly elongated to give support to the wing membranes

The hind-limb is connected with the vertebral column through the pelvic girdle, which is united with the sacrum. The bones of the hind-limb, which are homologous to those of the fore-limb, are the femur or upper leg-bone, the tibia and the fibula or lower leg-bone, the tarsal or ankle bones and the metatarsals and phalanges constituting the hind-foot. The peculiarities of the bones of the fore-feet in ungulates, already mentioned, are found also, with only slight modifications, in the hind-feet.

The terminal phalanges of both fore and hind feet are compressed and pointed in beasts of prey and such as climb or dig, forming claws, which are covered with horny sheaths. In large running mammals, the terminal phalanges are more or less broad and flat and likewise covered with horny sheaths, forming hoofs or nails Certain bones not connected with the skeleton, such as the os penis, os cordis, etc., are developed in the viscera of various mammals.

Teeth.—In mammals, unlike the lower vertebrates, teeth are not produced indefinitely, but in fixed number. At most two visible sets are developed Traces are found, however, of at least one pre-milk and one post-permanent dentition. The first, called the milk dentition, appears during infancy, being replaced by the second set, called the permanent dentition, as maturity is reached. The milk teeth are less numerous and usually smaller than those of the permanent set. Teeth occur only in the premaxillary and maxillary bones and the mandibles or lower jaw. The upper teeth are divided into incisors, which are almost invariably simple and stand immediately behind the suture between the premaxillæ and maxillæ; and premolars and molars, which occupy the edges of the maxillæ. The premolars have "milk" predecessors, while the molars have not. The nomenclature of the teeth of the lower

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jaw is the same as for those of the upper jaw, their character being determined by their relation to the latter and by their form and mode of development. While the greatest diversity exists as to the form of the individual teeth, and the development of the dentition as a whole, there are rarely more than 44 in all. The exceptions are among the marsupials, where the number rises to 54 in the marsupial anteater, Myrmecobius, and to 64 in a fossil form Amphitherium, also among the cetacea, one species of which has as many as 246 simple teeth. The true anteaters, Myrmecophagidæ, and the spiny anteaters of Australia, Echidna, are without teeth at any time, but many mammals which do not possess them when adult have rudimentary teeth in the fætal stages. Such is the case with the whalebone whales, and with the platvous. Ornithorhynchus. The rudimentary teeth in these disappear early and are replaced by whalebone in the case of the whales, and by horny plates resembling teeth in the

Teeth consists of two portions, the root and the crown. When most complex they contain three structural elements, the enamel, the den-tine and the cement. The enamel is hardest and is restricted to the crown, while the dentine makes up the mass of the tooth, and the cement usually surrounds the root, or fills spaces between the enamel-folds of the crown. The enamel develops from the epithelial tissue of the jaws, the dentine from the deeper-lying areolar tissue and the cement from the walls of the tooth-capsule Some teeth, such as the incisors of rodents, the tusks of the elephant, etc., grow continuously during life; other complete their growth early. Especially remarkable forms of teeth are the tusks of elephants, which are incisors, and the tusks of the narwhal, the boar and the babirussa, which are canines When the crowns of the teeth greatly exceed the roots in height, as in the horse, the teeth are said to be hypsidont or hypselodont; when the reverse is the case, the teeth are called brachydont. Teeth having the crown in the form of tubercles, as in the hog are called bunodont; those with transverse ridges, as in

the ox, many rodents, etc. are called lophodont.

Alimentary Canal.—The mouth, or entrance to the alimentary canal, contains the tongue, which in the majority of mammals is so attached below that it can be protruded but a short distance, but is often sufficiently free to be used in grasping food and turning it about in the mouth during the process of mastication. In those mammals which feed upon ants and termites, such as the anteaters, pangolins, etc, and also in certain fruit-eating bats, the tongue is very long and slender and can be extended far beyond the mouth. On the posterior surface of the tongue are the organs of taste, and the upper surface is often roughened by horny papillæ A number of large glands, called salivary glands, open into the mouth. Their function is to moisten the food and initiate the process of digestion. The glands most constantly present are the parotid, situated at the base of the ear, and opening under the appex of the tongue. At the back of the mouth is the entrance to the essophagus or gullet, usually a simple tube, leading to the

stomach The stomach is an oblong, curved sac, usually enlarged at the cardiac end where the œsophagus is attached, and smaller at the lower, or pyloric, end, where it joins the intestines. It is usually simple, but in the ruminants and the cetaceans consists of several chambers. The intestines join the stomach at the pyloric end They are usually of great length, and divided into two distinct sections. The portion nearest the stomach, called the small intestine, is joined below by one of larger diameter called the large intestine. The upper end of the latter is frequently dilated, forming a pouch called the cæcum, which in herbivorous mammals, and notably in rodents and many ungulates, is greatly enlarged or elongated. In man, the higher apes and the marsupial wombat it terminates in a narrow prolongation called the vermiform appendix Different sections of the small intestine have received the names duodenum, jejunum and ileum; and of the large intestine, colon and rectum. The inferior orifice of the intestines is the anus or vent. Generally speaking, the intestines and cæcum are shortest in carnivorous mammals and longest in such as are vegetable feeders, but the carnivorous whales and seals, which have long intestines, form a conspicuous exception

Besides the numerous glands situated within the intestine are two large ones, the liver and the pancreas, whose ducts open into the intestines near the stomach. The liver is a large, flat gland, which may be divided nearly into a right and a left lobe as in man, the cetacea and ruminants, or may have these lobes again subdivided into two by a longitudinal fissure. Two smaller lobes, called the Spigelian lobe and the caudate lobe, are commonly added. Attached to the liver is the gall-bladder, which is, however, absent in the cetacea and some other orders.

Kidneys.— The kidneys, whose function is to secrete urine, are situated in the upper part of the abdominal cavity near the vertebral column. They are two in number, oblong and usually simple, but in the cetacea, and also in bears and seals, are divided into separate lobules. A duct or ureter leads from each kidney to the urinary bladder, from which in turn a common duct, called the urethra, leads to the exterior of the body. In the monotremes, however, the ureters do not enter the bladder, but into a common urogenital passage or cloaca

into a common urogenital passage or cloaca Lungs.—The lungs are situated in the thorax, which is cut off below from the abdominal cavity by a muscular diaphragm whose action assists in the process of breathing. The lungs consist of two spongy lobes, a right and a left, which are free below, but attached above to the two principal divisions of the windpipe. In the cetacea and sea-cows, the lobes are simple externally, but in other orders are more or less subdivided. A third median lobe, called the azygos lobe, is present in some groups. Air breathed in through the nostrils reaches the lungs through the trachea or windpipe, the upper end of which, the larynx, lies in the throat. Its orifice, the glottis, is protected by a cartilage, called the epiglottis, which prevents particles of food from entering the windpipe. The larynx is made up of cartilages, of which the largest are the thyroid, the cricoid and the arytenoid. Within the larynx are the vocal cords, two parallel elastic, fibrous bands, whose

vibrations produce the voice. The lower end of the windpipe divides into two smaller tubes, or bronchii, each of which enters a lobe of the lungs and subdivides into numerous smaller branches A third bronchius, which enters the right lung, occurs in some cetaceans and rumi-

Heart.—The heart in mammals is fourchambered, consisting of two thin-walled auricles and two ventricles, both with thick walls, but the right, which supplies only the lungs, thinner than the left. There is no direct communication between the left and right sides of the heart after birth. The valve between the right auricle and the right ventricle is tendi-

nous, except in the monotremes

The aorta, or principal artery, bends toward the left immediately beyond its connection with the heart and gives off the innominate, left common carotid, and subclavian arteries, which, with their branches, supply the head and anterior limbs. The method of branching of these arteries from the aortic arch and from one another varies widely. Blood is carried from the alimentary canal to the liver by a single vein, except in Echidna, in which as in lower vertebrates the abdominal vein is present. The kidneys are supplied with blood only by the

renal arteries

Brain.—Except for certain fossil forms, the brain of mammals is characterized by its relatively larger size as compared with that of lower vertebrates, and especially by the magnitude of the cerebral hemispheres and the perfection of the connections between them. In most mammals the surface of the brain is divided by numerous irregular fissures and convolutions. They are absent only in small bats, rodents and insectivores, and in Ornithorhynchus. The largest forms in each order, generally speaking, exhibit the greatest complexity, and there has been a remarkable development in the class in this direction since Tertiary times. The cetacea have very large and complex brains, though they are small relatively, when compared with the size of the body.

when compared with the size of the body.

Sense Organs.— The organs of sense, except that of touch, are located in the head. The sense of touch is generally distributed over the skin, but is most acute in the snout, and in the extremities, except when used merely in locomotion. The wings of bats and the prehensile tails of monkeys are also especially sensitive. Some burrowing mammals, such as the mole, have imperfect eyes, the optic nerve being more or less atrophied. The Indian river-dolphin, Platanista, is a blind form, having rudimentary eyes, without crystalline lenses. The mammalian ear is characterized, besides the chain of ossicles, already mentioned, by the complex cochlea, which is usually spirally convoluted. The tympanic membrane, or eardrum, seals the auditory chamber from without. In the majority of mammals the external orifice of the ear is surrounded by a fold of skin, called the pinna or external ear. These are absent in cetaceans, sea-cows, seals, etc, which live in the water, and also in some burrowing mammals.

Reproductive System.—In mammals the female reproductive organs comprise the ovaries, Fallopian tubes or oviducts, uterus and vagina. The ovaries are two in number, a left and a right. Approximated to them are the

Fallopian tubes, which widen below and form the uterus In the lower mammals the uterus of each side is separate, but the two unite below in a common vagina, while in the higher groups, the uterus and vagina are both single. The male organs comprise the testes, spermatic cord and penis. In cetaceans, sea-cows and seals, which are aquatic, and in the elephants, conies and many edentates, the testes are internal in position, but in most other forms they descend periodically, or permanently, into a pouch of the integument, called the scrotum. The structure of the penis in mammals is peculiar to the class. An os penis is present in the majority of bats, insectivores, rodents, carnivores and primates

During development the mammalian fœtus is nourished through a complex structure, called the placenta, formed in part by the internal wall of the uterus of the mother and in part by the membranes of the fœtus itself. The placenta is characteristic of the class as a whole, but is not found in the monotremes, nor in most marsupials. The form and other characteristics of the placenta differ in the several orders of mammals and are regarded as of

importance in classification.

Distribution.—The geographical distribution of existing mammals, as of other animals, is the result of varied conditions and influences, some transient and others of long continuance, beginning in the relatively remote geological times when the class first made its appearance. Among the principal factors in the problem of distribution may be included changes in the extent and configuration of the land areas of the globe, changes in climate and in food supply, the appearance and disappearance of enemies. and latest, but by no means least, the interference of man. These and other factors in distribution are considered under the heading DISTRIBUTION OF LIVING MAMMALS only possible here to mention some of the more important facts in the distribution of mammals. Of widest distribution are the purely aquatic orders, the cetacea and pinnipedia, whose range covers all seas and reaches from pole to pole, but it should be noted that no sea-lions occur in the north Atlantic. Next follow the bats, whose range is nearly world-wide, but they do not enter the Antarctic zone, and only very few species cross the Arctic Circle. On the other hand, they are found in New Zealand and in oceanic islands where no terrestrial indigenous mammals occur. Of the purely terrestrial orders, the rodents have the widest range, covering every continent and reaching from the Arctic zone to Patagonia and Tasmania. Carnivores, like rodents, have an almost world-wide distribution, but in Australia only one species of the order occurs, the dog known as the "dingo," Canis dingo; and it is uncertain whether this may not have been introduced by man at a remote date. The monotremes (comprising only the genera Ornithorynchus, Echidna and Proechidna) are limited to Australia, Tasmania and New Guinea. Marsupials occur only in Australia, Tasmania, New Guinea and America. The American marsupials, with the exception of one genus, all belong to the family Didelphiidæ, or the opossums. Edentates occur only in America, southern Asia and Africa. They have their greatest development in South America. One genus, Tatu, extends northward

into Texas. Ungulates inhabit all continents except Australia, but only two or three species enter South America. Of the two groups forming the order Primates, the lemurs and lemur-oids occur only in Madagascar, Africa and southern Asia, while monkeys inhabit only Africa, southern Asia and South and Central America One ape, Macacus innus, is found at Gibraltar, but it is only doubtfully indicated and the south and the

digenous. Fossil Mammals.— Mammals are believed to have originated as an offshoot from certain Permian and Triassic reptiles called *Theromorpha* or *Anomodontia* The earliest recognizable remains of mammals are certain small teeth and jaw-bones found in the Triassic formations. They belonged to forms resembling monotremes and marsupials in some characters, but are usually placed in a separate order, called Allotheria or Multituberculata Representatives of the Allotheria continued on through the Jurassic and Cretaceous The existing orders of mammals first appear in the Eocene, the lowest for-mation of the Tertiary period, being foreshad-owed in the lowest beds of that period by certain generalized groups such as the Creodonta and Condylarthra The Eocene also contains remains of several groups, or suborders, of ungulate mammals, which have no living representative. sentatives. These are the Ancylopoda, Typotheria and Toxodontia

The later Tertiary and the Quaternary periods show a greatly increased number and diversity of forms Many of them represent families which persisted for only a relatively short period and are now extinct; others have continued to the present Among the oldest of existing genera are Didelphis (opossum), Sciurus (squirrel), Myoxus (dormouse), Sorex (shrew), Vespertiho and Vesperugo (bat) and Viverra (civet), which originated in the Eocene; Tahrus (tahir), Rhinoceros, Giraffa (giraffe), Elephas (elephant), Sus (pig), Talpa (mole), Erinaceus (hedgehog), Mustela (marten), Lutra (otter), Hyana, Felis (cat) and Phoca (seal), which originated in the Miocene Classification. The class Manualla was

Classification. The class Mammalia was divided by Lmnæus into three principal sections, Unguiculata, Ungulata and Mutica. The last comprises the cetaceans, the second all the ungulates except the elephant, and the first, the remainder of the class This classification was replaced by Blainville, who proposed on embryological grounds to divide the class into Monodelphia, or mammals with a placenta; Didelphia, or mammals without a placenta (the marsupials) and Ornithodelphia, or the monotremes. Richard Owen combined the last two subclasses under the name of Eplacentalia and gave the placental mammals the name of Placentalia. Speculation as to the origin of the class as a whole led Huxley to propose as the source a hypothetical group which he named Hypotheria, the characters assigned being the absence of milk glands and of a corpus callosum in the brain and the presence of a quadrate bone for the articulation of the mandible Exbone for the articulation of the mandiable Extisting mammals were divided into Protothera, comprising the monotremes, Metatheria, the marsupials, and Eutheria, the so-called placental mammals. Cope in 1889, while retaining the subclass Prototheria for the monotremes, placed the entire remainder of the class in the stabelies. Butheria Riower and Indelberg Putheria Riower and Indelberg subclass Eutheria. Flower and Lydekker

(1891) adopt Huxley's divisions, while Beddard (1902) makes use of those of Cope. Flower and Lydekker's arrangement of families and higher groups is as follows (fossil groups printed in italics):

Subclass 1. Prototheria

Order 1. Monotremata (Monotremes) Families Ornithorhynchidæ, Echidnidæ, (Group, Multituberculata or Allotheria Families Plagiaulacidæ, Polymastodontidæ, Tritylodontidæ).

Subclass 2. Metatheria.
Order 2. Marsupilia (Marsupials).

Suborder 1. Polyprotodontia
Families Dromatherudæ, Amphitheridæ, Spalacotherndæ, Didelphyidæ, Dasyuridæ, Peramelidæ.

Suborder 2 Diprotodontia Families Phascolomyidæ, Phalangeridæ,

Diprotodontidæ, Nototherudæ, Macropodidæ.

Subclass 3. EUTHERIA.
Order 3. Edentata (Edentates).
Families: Bradypodidæ, Megatherida,
Dawpodidæ. Glytto-Myrmecophagidæ, Dasypodidæ, Glypto-

dontidæ, Manidæ, Orycteropodidæ Order 4. Sirenia (Sea-cows). Families · Manatidæ, Rhytinidæ, Halicori-

dæ, Halitherndæ
Order 5. Cetacea (Cetaceans)
Suborder 1. Mystacoceti (Whalebone

whales)

Family: Balænidæ.
Suborder 2. Archæoceti.
Family: Zeuglodontidæ.

Suborder 3. Odontoceti (Toothed whales). Families Physeteridæ, Plaatanistidæ, Delphinidæ.

Order 6. Ungulata (Hoofed mammals). Suborder 1. Artiodactyla (Even-toed un-

gulates).
Families Hippopotamidæ, Suidæ, Charopotamidæ, Anthracotheriidæ, Meryco-potamidæ, Cotylopidæ, Anoplotheriidæ, Dichodontidæ, Tragulidæ, Camelidæ, Poebrotheriidæ, Cervidæ, Giraffidæ, Antilocapridæ, Bovidæ.

Suborder 2 Perissodactyla (Odd-toed un-

gulates). amilies. Tapiridæ, Lophiodontidæ, Pal-Equidæ Rhinocerotidæ, Families. æotheriidæ, Equidæ, Rhinocerotidæ, Lambdotheriidæ, Chalicotheriidæ, Ti-tanotheriidæ, Macrauchenidæ.

Suborder 3 Toxodontia.
Families: Toxodontidæ, Typotheriidæ
Suborder 4. Condylarthra.
Families: Periptychdæ, Phenacodontidæ,

Memscotheridæ.
Suborder 5. Hyracoidea (Conies).
Family: Hyracidæ
Suborder 6. Amblypoda.
Familes: Pantolambdidæ. Coryphodonii dæ, Uintatheriidæ.

Suborder 7. Proboscidea (Elephants). Families: Dinotherida, Elephantida. (Group Tillodontia).

Families: Anchippodontidæ, Calamodon-

tidæ).
Order 7. Rodentia (Rodents).
Suborder 1. Simplicidentata.

Families. Anomaluridæ, Sciuridæ, Haplodotidæ, *Ischyromyidæ*, Castoridæ, Myoxidæ, Lophiomyidæ, Muridæ, Spalacidæ, Geomyidæ, Dipodidæ, Theridomyidæ, Octodontidæ, Castoroididæ, Hystricidæ, Chinchillidæ, Dinomydæ, Caviidæ, Dasyproctidæ

Caviidæ, Dasyproctidæ
Suborder 2. Duplicidentata
Families Lagomyidæ, Leporidæ
Order 8 Carnivora (Carnivores)

Suborder 1. Carnivora vera (Fissipeds)
Families: Felidæ, Hyænidæ, Protelidæ,
Viverridæ, Canidæ, Ursidæ, Mustelidæ,
Procyonidæ.

Suborder 2 Pinnipedia (Pinnipeds)
Families: Otariidæ, Trichechidæ, Phocidæ.

Suborder 3 Creodontia

Families · Hyanodontida, Proviverrida, Arctocynida, Mesonychida

Order 9 Insectivora (Insectivores).
Suborder 1 Insectivora vera

Families Tupaiidæ, Macroscelididæ, Erinaceidæ, Soricidæ, Talpidæ, Potamogalidæ, Solenodotidæ, Centetidæ, Chrysochloridæ.

Suborder 2 Dermoptera
Family Galeopithecidæ
Order 10 Chiroptera (Bats).
Suborder 1 Megachiroptera.
Family Pteropidæ
Suborder 2 Microchiroptera

uborder 2 Microchtroptera Families Vespertilionidæ, Nycteridæ, Rhinolophidæ, Emballonuridæ, Phyllostomatidæ

Order 11. Primates

Suborder 1 Lemuroidea (Lemurs and Lemuroids)

Families : Hyopsodontidæ, Chiromyidæ, Tarsiidæ, Lemuridæ

Suborder 2. Anthropoidea (Monkeys and Man).

Families: Hapalidæ, Cebidæ, Cercopithecidæ, Simildæ, Hominidæ

The groups of existing mammals whose structural peculiarities are such as to entitle them to rank as separate families vary greatly as regards the number of genera and species they comprise, some being represented by a multitude of different forms, while others consist only of a single species, or a single genus with but a few species Families consisting of only a single genus and species are as follows. The Chiromyidæ, established for the reception of the Aye-Aye, a singularly modified lemuroid mammal, confined to Madagascar; the Dinomyidæ, comprising only a large Peruvian rodent, somewhat like a paca, of which a single specimen is known; the Antilocapridæ, represented only by the Prong-horn of the western plains of North America; the Notoryctidæ, comprising only a small mole-like marsupial recently discovered in South Australia; the Ornithorhynchidæ, comprising only the Platypus, or Duck-bill, of Aus-These and other restricted families are tralia. to be looked upon as fragments of groups of genera and species, of which the greater number are extinct, or as branches from main lines development which have never progressed and ramified

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(7th ed, Jena 1900, tr. and abridged by Parker, London 1908)

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MAMMARY GLANDS, the milk-glands of immalian animals (see Breist) They are mammahan animals (see Breist) present in all mammals, in both sexes, but in the male are usually rudimentary, their functional activity being limited to the female, who secretes in these glands the milk for nourishing her young during a natural period after birth. In all mammals they are placed in pairs, but vary much in position and number in different groups Zoologists give them names according to their position near the armpits (axillary), on the chest (pectoral), on the belly (ventral or abdominal), or near the groin (inguinal) They are never situated on the back. The number in an individual may be from 2 to 12 or more, and is usually even. The structure of the cow's udder as due to the uniting of the same number of mammæ as there are of teats, the number of which, when more than two, usually corresponds to that of the young produced at each birth. The mammary glands of Marsupialia (q v) are contained in the pouch. In monotremes duck-bills and echidnas—the mpple is not present. (See Prototheria)

Diseases of the Mammary Glands.- The common inflammation of the glands (mastitis) is often attended by much swelling, with fever and painful tenderness. The formation of pus is apt to result in a slowly pointing abscess Great care in diet and regulation of the bowels should be observed. Purgatives and fomentations may be necessary, also in many cases the placing of the arm on the affected side in a sling. Drawing off the malk and evacuating the pus may be practicable and will afford great relief. Pain in the breasts (mastolynia) may result from many causes, of which sore nipples is one of the most frequent. The nipples are also subject to cracks, ulcerations, etc, which occasion much difficulty and pain to the mother when suckling the child. Lotions of an astringent character, as tannan, etc., have a remedial effect in such disorders, as have also collodion and lunar caustic (nitrate of silver), when applied to the sore nipple. Metallic shields are used in severe cases for protection of the affected point Among many specific disorders to which the mammary glands are hable are cancer and galactocele and other forms of tumor. See Milk Fever

MAMMEE APPLE, or SOUTH AMERICAN APRICOT, the fruit of a clusiaceous tree, bearing white, showy, fragant flowers, growing naturally in tropical America, but largely cultivated in tropical parts of the Old World The fruit is several inches in diameter, with a double rind and a yellowish pulp like that of an apricot, which is sweet and nourishing and is eaten raw or with wine and sugar or is boiled. A spirituous liquor called Eau Créole is distilled from its flowers; and the gum exuding from the bark is used by the Central Americans for destroying chigoes in the feet. This gum-resin is similar to the "gamboge" derived from a closely related West African tree (Garcinia hamburyi).

MAMMON, a term popularly held to be a mere personification of riches. It is used in Matt vi, 24 and Luke xvi, 9 Milton makes Mammon a fallen angel of sordid character

MAMMOTH, an elephant (Elephas primigenus) which inhabited the temperate parts of the northern world during the Glacial period, and at its close spread northward with the retreat of the ice, and survived until the Neolithic period of human history Some account of the origin and probable wanderings of the species is given in the paragraph relating to fossil elephants under ELEPHANI Mammoth remains have been found in intimate association with the handiwork of savage man; and upon a piece of hone a portrait of this animal was found scratched, the accuracy of which shows a close acquaintance by the Cave-dwellers of France with the animal in life, and much artistic skill This elephant, although the word "mammoth" has become an expression for hugeness, was little if any larger, on the average, than the modern Asiatic elephant, to which it was nearly related Its remains are abundant and enable us to reconstruct its form and features completely, especially since the remarkable discovery, first in 1799, of carcasses frozen into the icy cliffs along the Arctic coast of Siberia One of the most important discoveries of this kind occurred in 1801 Since the earliest known times ivory from buried tusks of these animals has been obtained from northern Siberia and Alaska, and many curious stories were invented to account for its origin, especially among the Chinese, who had never seen an elephant; but the specimens above mentioned contained not only the tusks still in their sockets and every bone in its place throughout the skeleton, but a great part of the flesh was in a condition fit for sledge-dogs to eat and enjoy, and was covered with thick skin still clothed with long dark hair, beneath which was a dense woolly fur, well fitted to protect the animal against arctic cold The ears were much smaller than those of modern elephants. This specimen of 1801, which is preserved in the Royal Museum at Saint Petersburg in the attitude in which it was found buried, measured 16 feet 4 inches from the forehead to the extremity of the tail; its height was 9 feet 4 inches, and the tusks, along the outer or greater curve, measured 9 feet 6 inches. Of other well-known specimens, that skeleton mounted in Chicago is one of the largest the second of the largest terms. gest known, and its tusks measure 9 feet 8 inches. The largest tusks on record are a The largest tusks on record are a pair found in Alaska which measure 123/4 feet in length All mammoth tusks show an outward and upward sweep very distinct from the growth of elephant tusks The mammoth seems to have been extremely numerous all over northern Europe, Asia and North America, especially during post-glacial times, when northern Asia was covered with pine forests to the borders of the Arctic Sea, affording plentiful food in their leaves and twigs upon which these animals browsed. The disappearance of these forests, due to slow climatic changes, is supposed to be the principal influence which led to the extermination of the species, a fact otherwise not easily to be explained. It is probable wise not easily to be explained it as probable that human hunting had much to do with the mammoth's final disappearance. (See also ELEPHANTS; FOSSIL). Consult Beddard, F. E., 'Mammaka' (New York 1902); Lucas, F. A, 'Animals of the Past' (ib. 1901); Scott, W. B.,

(History of Land Mammals in the Western Hemisphere) (ib 1913), Herz, O.F., Frozen Mammoth of Siberia, (Washington 1904), See Mastodon

MAMMOTH CAVE, Ky, a remarkable American cavern, in Edmondson County, & miles southwest of Louisville, reached by a small branch line connecting at Glasgow Junction with the Louisville and Nashville Rail road Its areal diameter is about 10 miles, and about 100 miles of passageway have been explored, including avenues, chambers, pits, domes and rivers What is termed the Main Cave is three miles long, varying in width from 40 to 175 feet and in height from 40 to 125 feet Its greatest enlargement is known as the Chief Cuty (or Temple), an oval 100m 541 feet long, 287 feet wide and 125 feet high, anciently a rendezvous of the Indians, whose torches and other relics have been found in abundance The Star Chamber mimics the starry heavens by reason of its lofty ceiling of black oxide of manganese flecked by snowy crystals of gypsum The cavern exists in five successive gypsum The Cavern exists in five successive tiers, through which, at various points, shafts have been cut, which are styled pits or domes, according to the point of view The largest are the Bottomless Pit, Goin's Dome, the Mammoth Dome and the Maelstrom, and their average doubt is about 100 fact. Over down the reserved age depth is about 100 feet. Oval depressions, locally known as "sink-holes," drain through the pits and chasms and form subterranean lakes and rivers; which finally find an outlet to the neighboring Green River The largest, the Echo River, gets its name from the wonderful reverberations of sound along its course. Boats are provided for short voyages. Eyeless fish abound, of which there are three or four species; besides, blind crawfish, blind crickets, flies, beetles and spiders and other abnormal fauna are found on the walls and under the rocks. The structure and habits of these animals have been studied with great care

Beyond River Hall long avenues extend, many adorned by marvelous gypsum rosettes and brilliant arches of crystal efflorescence in the most fantastic diversity Cleveland's Cabinet as frequently mentioned as a treasure-house of cave flowers, but some of the smaller rooms, for instance, Charlotte's Grotto, can boast of finer displays. The great cavern is said to end at Croghan's Hall, where is the Maelstrom already mentioned, but the few who have dared go to the bottom of this profound abyss report wide and long avenues beyond, which are yet to be explored. Everywhere, even in the deepest pits, the atmosphere is both chemically and optically pure; the temperature is uniformly about 54° F. all the year around, as has been determined by a long series of exact scientific observations, in order to discover the temperature of the crust of the earth.

The discovery of the Mammoth Cave is usually credited to a hunter named Hutchins, in 1809; but the present manager of the estate finds that the county records, in 1797, fix the entrance to thus cavern as a landmark for a piece of real estate. The locality first gained notoriety by reason of its immense deposits of saltpeter, which were used in the manufacture of gunpowder during the War of 1812. After passing through the hands of several owners, the cave was bought by Dr. John Croghan, who

willed it to his nephews and nieces, with instructions that at their death it should be sold at auction. The acquisition of an area of over 70,000 acres, to be known as Mammoth Cave National Park, was authorized by Congress in 1926 See also CAVE; CAVE ANIMALS.

MAMMOTH HOT SPRINGS. See YEL-

LOWSTONE NATIONAL PARK

MAMO, a bird (*Drepanis pacifica*) of the Hawaman Islands, related to the creepers, and now nearly extinct because of the great demand in past years for their yellow feathers for making the feather-cloaks formerly worn as insignia of royalty by the chiefs. Other birds supplied certain other required feathers. Very few of these cloaks remain in museums

MAMORÉ, ma-mō-rā', a river of Bolivia which has its rise in the Cordillera Real, near Sucre, and flows first east by south, then forms almost a semi-circle toward the north to Trinidad, from where its course is nearly north to where it unites with the Beni and forms the Madeira River. In the first part of its course it is called Rio Grande. The Mamoré is about 1,300 miles long and navigable for about 1,000 miles, with some obstructions. About 40 miles above its junction with the Beni are the Guajara Falls, above which navigation is free for about 400 miles to places where fallen logs have filled in between the banks and formed dams.

MAMPALON, an aquatic animal (Cynogale bennetti) of Borneo, of the civet family. It is otter-like in form, is about 18 unches long, has stout webbed plantigrade feet and is thoroughly adapted to an aquatic life while retaining purely wiverrine characteristics of structure.

MAN. See Anthropology; Ape; Archæology; Ethnology; Primates

MAN, Christian Anthropology. The thorough discussion of the theory of evolution for the past two generations has served to make it clear just what contributions to the problems of man's origin and place in the universe have been made by modern science. For a time it was felt that the whole mystery of man's existence was to be solved. It is now recognized that in spite of our great advance in knowledge, to use Bryce's expression the "mists that hang around man's origin and man's destiny are so far as scientific knowledge goes just as deep as ever "Only those who fail to appreciate that science does not solve mysteries, but multiplies them, are of the opinion that biology, notwithstanding all its contributions to our knowledge of man, has furnished the key to the problems of anthropology lems of anthropology More now than ever those who know our modern science feel that for any reasonably adequate understanding of man's nature and place in the universe a reference to the records of man's religious experi-ence must be made. The time for the synthesis of Christian and scientific views with regard to man has come to them, not with the purpose of reconciliation, for no reconciliation is needed. but for a proper understanding of the philosophy of life that lies behind both science and faith

The enthusiastic reception which always greets a novelty in thought even in the serious domain of science led many to exaggerate the significance of the theory of evolution (qv) through natural selection which came to occupy

so much attention in the biology of the second half of the 19th century. As a result a widespread impression prevailed that evolution had accounted so completely for the origin of all living beings from the lowest to the highest as they exast around us that the idea of creation and a Creator was no longer tenable The closing words of Darwan's 'Origin of Species' makes it very clear that the great English scientist himself had not, as a result of his elaboration of the theory of natural selection as an explanation for evolution, given up his belief in creation or the Creator nor felt that his scientific work had any tendency to produce disbelief in religious traditions in this matter. He said "There is grandeur in this view of life with its several powers having been originally breathed by the Creator into a few forms or into one; and that, while this planet has gone circling on according to the fixed law of gravity, from so simple a beginning, endless forms most beautiful and most wonderful have been

and are being evolved»

What Darwin thus brought to be the basic thinking of scientists in the latter half of the 19th century was the theory of descent or derivative creation, that is, creation of one or more simple forms of life to which were given the power of developing with the production of higher forms. This teaching of derivative creation is not modern in origin, but on the contrary very old. Christian philosophers from the earliest times formulated opinions clearly expressive of this view. Saint Augustine suggested that the original creation was of semina rerum, "the seeds of things." These seeds once brought into existence went on developing until the universe of living things which we see around us came into existence. This teaching of Saint Augustine became the Christian tradition down the centuries. Saint Thomas Aquinas (13th century), whose writings by the special direction of the Pope are the accepted authority in the Catholic theological schools of the world to-day, was a close disciple of Saint Augustine in this as in most other questions. Cornelius a Lapide (1567-1637), looked up to as an authority scarcely less than Saint Thomas on biblical matters, followed Augustine's teaching. When St George Mivart not long after the publica-tion of Darwin's 'Origin of Species' pointed out in his 'Genesis of Species' that Suarez, the great Spanish theologian, taught this doctrine of derivative creation, it made quite a sensation among those who had been inclined to think of certain narrow literal interpretations of Scriptural expressions as the constant Church tradition. The sensation subsided, however, when it came to be recognized that this teaching of Suarez far from being exceptional represented the most conservative Christian opinions since the time of the Fathers Suarez actually wrote «a separate section of his metaphysics in opposition to those who maintained the distinct creation of the various kinds - or substantial forms - of organic life" (Mivart). crude anthropomorphic notion which had gained popular credence, that the Creator had as it were fashioned each of the species directly out of earthly materials, had not been accepted by earlier philosophic thinkers. So far as it came to be the belief of those who gave any attention to the subject, it was a late gloss on the Scriptural account of creation

founded on the narrower views which became common only after Luther's movement made the literal interpretation of the Bible the sole rule

of faith.

Only the knowledge of the genuine Christian tradition in the matter was needed to dispel the idea of any incompatibility betwen the theory of evolution in the true scientific sense of the term and creation. It is just as much creation, if hut a single form of life were evoked from nothing, the great law of evolution being impressed upon it so that at gradually grew more complex until the whole series of living beings that we see around us came into existence, as if each being were created by a special act. The creation of species would under that explanation be the granting of power to any particular form of life to lift itself above what it was by inheritance from its progenitors The special creation of man would then be the gradual formation of his body from the earth through a long series of ever-developing hung beings until the organism had reached a stage of development capable of providing the mechanism suitable for a rational soul to act in association with matter Only when this living matter had become suitable for co-ordinate activities with man's spirit was the rational soul breathed into the body, which by this inspiration was made like to its Creator.

The Scriptural description of Creation is summed up in the words "Let the earth bring forth each living creature in its kind, cattle and creeping things, and beasts of the earth according to their kind, and it was so done." "And He said let us make man to our own image and let him have dominion over the fishes of the seas and the fowls of the air and the beasts and the whole earth and every creeping creature that moveth upon the earth."

"And God created man to His own image."

It is the rational spirit of man that is Divine and there is no good reason to forbid the thought that God may have created the body to receive that spirit by a long succession of evolutionary steps. To many there would seem to be more reverence in that idea than if seem to be more reverence in that luca than it God took red earth (Adam, in Hebrew) and fashioned the body directly and then breathed the spirit into it. Wasmann in his 'Modern Biology and the Theory of Evolution' reminded us that the taunt that orthodox believers imagined the God of the Bible as a sort of potter in human form fashioning for Adam a body of clay was utterly unjustified Adam a body of clay was utterly unjustified by any real knowledge of Christian tradition. Saint Augustine described any such imagination as nimum puerilis cogitatio - "entirely too puerile for consideration »

Newman called attention to the Scriptural expression in Genesis (ii, 7): "The Lord God formed man of the dust of the ground and breathed into his nostrils the breath of life and man became a living soul," and comments: "Here are two acts on the part of the Creator the forming the dust, and the breathing the fe. . . . Man was made rational after he

was made corporeal»

Wasmann said, quoting Saint Augustine once more, that "It would seem more fitting to believe that in producing the first man as in producing all other creatures, God employed natural causes as far as they were capable of co-operating toward this aim." Wasmann con-

tinues, "We must, therefore, admit that it would be possible for anyone to account for the origin of the human body by assuming God to have created a primitive cell and to say that the earliest ancestors of man were organisms living as simple cells; later on as the organs were differentiated and the nervous system was formed and a sensitive soul came into existence they developed into animals. The organism gradually increased in perfection and as the brain developed this soul in course of time prepared a human body suited to be the dwelling of a rational soul and, through possessing highly developed brain cells, able to satisfy the conditions of spiritual activity and its verbal expression Assuming this theory to be true we may still say that man certainly only became man at the moment of the creation of his rational soul "He adds that "any objection to this theory (on the score of lack of dignity in the procedure) may be met by a reminder that man's body even now is produced by germinal development from a fertilized ovum »

The question as to whether man's body came by such a process of evolution through the animals still remains open. It is now confessed by scientists to be quite absurd to suggest that man is descended from the monkey, and Klaatsch went so far as to say that man is not descended from the monkey because the monkey is degenerate man. The generally accepted idea is that both the monkey and man came from a remote ancestor, one branch of whose progeny continued an upward course in the direction of the human body, while the other degenerated into that of the monkey. This is, however, entirely theory. There is no evidence for it and though Zittel gives no fewer than 30 genera of fossil pro-simæ and 18 genera of fossil apes not one connecting link has been found between their hypothetical and ancestral form and man of the present time. "The whole hypothetical pedigree of man is not supported by a single fossil genus or a single fossil species" (Wasmann). The pithecanthropus erectus or so-called Trinil man of Java has all of his scientific relationship to man in the word anthropus, the name forced upon him at the beginning, for he does not belong to the pedigree of modern man, but to that of the

modern apes. A great many people in our time are of the impression that it was not until the serious discussion of the theory of evolution came up that man's intimate relations to the animals was recognized. It has been the teaching of Christian philosophers from the very beginning that man is an animal, and the definition for man adopted from the Greeks by all Christian writers was that he is a rational animal. As to where his body came from Christians are manifestly free to believe—if they think there is evidence for it—that the animality of man is the result of a process of evolution by which in the course of biogenesis the human body de-veloped through the animals and then was raised by special creation to the highest species by the introduction of a soul. Those who ar-gue that there is no need for this special creation of man are as a rule scientists whose interests have been largely centred on man's relationship to the animals rather than on his superiority to them. The zoologist, intent on the

morphology of the human body and its intimate relation to animal bodies, easily minimizes the extremely great difference that his mind confers upon man Zoologists have suggested that man may be defined as "a tool making and tool using animal" If that were all that man really is, then there would be no need for the special creation of a soul Man looked on as merely a higher animal is "a tool-making, tool-using animal," but as a rational animal, man is a thought-creating being, and this places an immense gap between him and the other animals There can be no question of any process of evolution from the animal accounting for the being which produced the 'Iliad,' or the 'Divine Comedy,' or Shakespeare's 'Hamlet,' or created Hagia Sophia or Saint Peter's, or painted the Sistine Madonna To comprehend their origin we recur to the introduction of some great new force from without. The necessity for a definite series of renewed impulses putting new powers of development into living beings becomes clearer the more biology is studied. That evolution could have occurred by a series of very slight changes for which chance might be appealed to has now been definitely given up Such genesis of species as science has been able to trace has come by rather large jumps for which there is no sufficient cause in the conditions of preceding life Manifestly some new force has been introduced into nature and it cannot be thought seeing the results that this occurred without design As we shall see teleology or the place of design in the world has come back into biology with renewed force in recent years.

Many seem to think that the more careful study of the significance of natural selection in the world of life had entirely done away with any necessity for an appeal to forces outside of nature to account for evolution Any such thought, however, is due to failure to recognize the real place of natural selection as a factor in evolution and to hand over natural processes to the influence of chance Almost needless to say chance is only a word used to indicate our lack of knowledge of the factors at work in any problem. Creative direction was the phrase that Lord Kelvin preferred to use as descriptive of the forces at work bringing about whatever development there is in nature. Darwin himself did not believe that natural selection did away with the necessity for creation and expressed himself to this effect in the last sentence of his book. He realized very clearly that though his book was called the 'Origin of Species' it did not discuss origins, but, on the contrary, preservations He would have preferred to call it by its secondary title 'The Preservation of Favored Races in the Struggle for Life.)

The exaggeration of the significance of the phrase "struggle for life" led many to the belief that this process of struggle did away with the idea of an over-ruling Providence, and particularly of any fostering relationship on the part of a Supreme Being. In this once more as in so many other departments of evolution the Darwinians, so-called, went ever so much farther than Darwin himself, who recognized very clearly and emphasized the fact that the struggle for life did not mean any personal conflict between animals to the death, but on the

contrary such reaction of vital forces to the environment in which the animal was placed has brought out all its powers and gave it a higher vitality than it would otherwise have had As Huxley said, "Life is a game infinitely more complicated than chess and the player on the other side is hidden from us" "We know that his plays are always fair, just and patient. To the man who plays well the highest stakes are paid with that sort of overflowing generosity with which the strong shows delight in strength" This is a much better picture of the struggle for life than many of those given by the Darwinians and even by Huxley himself when he was in ultra-Darwinian mood

Biological developments have served to minimize the place of the struggle for life and to emphasize mutual a d as a factor in the process of evolution While the idea of the struggle for life dominated biology it seemed to many as though evolution had been handed over to blind forces, largely composed of strength and the advantage which might gave to the stronger animal An exaggeration of the significance of the struggle for life against which Darwin had warned, but which was taken up by the Darwinians as representing the most important chapter in biology, made a great many people believe that the law of nature was that the stronger survived and that the weakest must go to the wall, that nature had no care for the individual, but only for the race, and that life was just a huge gory spectacle of death inflicted on living things by other living beings that happened to have secured the advantage over them. Even Huxley, usually so careful, was carried away by this view and in his essay on "The Struggle for Existence in Its Bearing upon Man," suggested that "From the point of view of the moralist the animal world is about on the same level as a gladuator's show The creatures are fairly as a gladiator's show well treated and set to fight; the strongest, the swiftest and the cunningest live to fight another day. The spectator has no need to turn his thumb down as no quarter is given."

Russian biologists, in the face of the immense difficulties for living things provided by the severe climate of their country, came to recognize early that it was not the individual of greatest strength that always survived, but that nature provided a great law of helpfulness among the animals. They called attention then to the principle of mutual aid as of probably more importance than the struggle for life as a factor in evolution and it has now come to be recognized that practically all living things have instincts of mutual aid that are extremely precious for them. The smallest living beings, the insects, frankly live community lives for mutual protection, not only against enemies but against the vicissitudes of climate and for the conservation of food. The smaller mam-mals often live in villages, so-called, or groups that prove distinctly helpful. Even the larger mammals possess the same precious instinct, and wild horses herd together for protection against packs of wolves which hunt together because thus they are able to overcome even the very large animals. A drove of wild horses, when attacked by a pack of wolves, gather in a circle, heads toward the centre,

leaving a space on the inside for the foals and presenting on the outside to their enemies

only a battery of heels

Cows herd together and practically all
the ungulates and even such huge beasts as the elephants protect the young by traveling in groups sometimes containing as many as 20 When attacked by one of the big cats, the lions and the tigers, which find baby elephants particularly a toothsome morsel, the old bull elephants on the outside of the herd prove finely capable of affording protection Far from competition within the species being the law of biology, mutual aid is a deeper instinct in most cases, and very rarely does it happen that animals of the same kind struggle with each other for sustenance, except in cases of famine or when a mother under difficulties is seeking food for her young Under these conditions the moral law does not and among men, though the exceptions only prove the rule of the existence of law, and among animals these rather striking exceptions prove that there is a law or instinct of mutual aid by which the animals

help each other very materially. Two things are necessary for the preserva-tion of species One is food provision and the other is propagation of the race. Food provision under certain circumstances may necessitate the struggle for existence, but the propagation of the race involving as it does the existence of small weak animals necessitates a law of mutual aid and such is actually found to exist. The overemphasis on food provision and the failure to appreciate at their true value the conditions necessary for raising the young weak animals led to an unfortunate misunderstanding in biological science As Prince Kropotkin suggested "men came to conceive the animal world as a world of perpetual struggle among half starved individuals, thirsting for one another's blood. They made modern literature resound with the war cry of 'woe to the vanquished) as if it were the last word of modern biology They raised the 'pitiless' struggle for personal advantages to the height of a biological principle which man must sub-mit to as well, under the menace of otherwise succumbing in a world based upon mutual extermination. What we have found instead of "nature red in claw and tooth" is the great principle of charity, or the dearness of fellow-beings existing all over nature. The animals help each other, many of them delight to play with each other and animal sports are common, they care above all for the young and the weaklings and for whatever of evolution has come this has been a prominent factor. struggle for existence is incidental to life but the great law of mutual aid is a fundamental instinct in living beings, a basic anticipation of the law of charity among men which though often violated remains deep in human hearts as the impress of brotherhood

The theory of evolution and of descent was very seriously disturbed by Weismann's injection into the discussion of the principle of the non-inheritance of acquired characters. It was easy to theorize that anything acquired by an animal in its struggle for existence would make it more likely to be preserved and this would give the next generation a better chance and would be passed on in ever more favorably modified forms to succeeding generations until

a new species would result. Once it came to be acknowledged however as it had to be, that acquired characters are not transmitted, or so rarely as to be quite an exception to the order of nature, then this scaffolding of theory collapsed, leaving some other explanation of the gradual improvement of living things to be evolved As pointed out by Driesch the only thing that would explain the upward steps in descent is that definite heightening impulses were put into living things from without with the purpose that they should improve in order of being. In this too modern science finds itself under the necessity of recurring to a creative impulse, a creative evolution, such as was included in the explanations of the great philosophic fathers of the Church Darwin his 'Descent of Man' said "The birth both of the species and of the individual are equally parts of that grand sequence of events which our minds refuse to accept as the result of blind chance (Vol II, p 396). The argument from design in the world

for the existence of a Creator is now actually stronger than ever in scientific minds, and a review of all the purposes that exist among living things makes it quite impossible to believe that they were developed without a Designer The telling arguments against ultra-Darwinism, the evidence that the struggle for existence and natural selection are not only not exclusive factors, but not even important elements in the differentiation of species, have been found in those domains of creation which exhibit the strongest proofs of design. The story of the complex instincts of many animals and particularly the insects make it very clear that they could not have come into existence by any mere chance, that is, purposeless succession of events, and least of all by any accumulation of minimal fortuitous changes which finally modified function and organ to the extent needed for the perfecting of instincts as we know them Insects would have been handicapped rather than favored in the struggle for life during the in-termediate stages of the development of these instructs and the apparatus connected with them. They would therefore have perished before the instincts had become useful Fabre, the great French entomologist whom Darwin proclaimed "an incomparable observer," has been the strongest opponent of natural selection or chance being in any way responsible for insect instincts. He insists that it is quite impossible to conceive of these instincts coming into existence except as the result of design. Fabre, discussing the modern theory of instinct, does not hesitate to say that "theories of atavism, of natural selection, of the struggle for life cannot interpret it reasonably. He even went so far as to add with regard to theoretic explanations of the life and instincts of the insects - and surely no one had a better right than he to an opinion on this subject - that he saw in them "no more than an ingenious game in which the arm-chair naturalist who shapes the world according to his whim is able to take delight but in which the observer, the man grappling with reality, fails to find a serious explanation of anything whatsoever that he sees? For Fabre every portion of the insect world is a manifestation of design. "The wing of a cricket, that wonderful piece of lace work emerging from a tiny sheath, speaks to us of another Architect - the Author of the plan ac-

cording to which life labors »

Regeneration is the other phase of biology which after instinct has served to make it very clear that any chance result of the struggle for life could not serve as an explanation of biological developments. Professor Thomas Hunt Morgan of Columbia University did not hesitate to say that there are "insurmountable objections to the view that the process of regeneration can have been produced by natural selection " He quotes Driesch that "We can only reach a satisfactory view of the phenomena (of ontogeny) when we introduce the word purpose This means that we must look upon ontogeny as a process carried out in its order and quality as though guided by an intelligence."
Teleology then has come back with redoubled force, and anyone who is not willing to stop short of our ordinary processes of reasoning in matters of science must recognize the existence of design and the constant manifestation of purpose in living things around us

Once this is admitted the reversion to the old Christian doctrine of Creation and of conservation in the sense not only of preservation but of the provision of such additions to energy as may be needed for developmental purposes becomes imperative. These are really succes-sive creations beyond nature's unaided powers It is true that many scientists refuse to take the logical step in this direction, but it seems clear also that their determining reason for doing so is that they cannot bring themselves to revert to the conservative position of the older time Weismann for instance suggested that if there was no such thing as spontaneous generation scientists would have to admit creation He confesses frankly that all the scientific evidence of the present time is distinctly against the occurrence of spontaneous generation, yet he insists that it is the duty of scientists to accept abiogenesis rather than to concede the necessity for creation. With creation as the beginning of life and this origin of "the seeds of things" with the absolute necessity for some extraordinary intervention to bring about the differentiation of man the thinker from the animals, the necessity for a creator is affirmed by science; hence the declarations to this effect made by many distinguished scientists of the 20th century. Indeed the greater the scientist the more conservative is his position in this matter as a rule. Evolution so far from contradicting Christian teaching has simply served to make clearer the process by which man's origin was brought about and his relationship to the world around him. Absolute freedom is left for further research in speculation along these lines and Catholic biologists particularly have never felt themselves hampered in the slightest degree by their faith or by the teaching of the Church in the matter.

Many students of science and particularly readers of popular science have become persuaded that the so-called biogenetic law gave absolute assurance not only of man's descent from the animals but of his origin from a single cell being and his progress through the various forms of life up to his present physical status. The human, like other embryos, is supposed to pass through stages which indicate very clearly that it follows the law contogeny recapitulates phyllogeny. As Koken remarked

very justly, the so-called biogenetic originated in a superficial view of facts more embryology has been studied the less scientists have been willing to accept it Oscar Hertwig insists that in any statement of the law we must leave out the words "recapitulation of forms of extinct ancestors" and substitute for them "repetition of forms regularly recurring in organic development and advancing from the simple to the more complex." Almost needless to say this destroys the original significance of the law. There is scarcely any question now among biologists that the stages noted in the embryonic development of man, or of any other animal, are there not because they serve to record a repetition of ancestral forms, but it is definitely taught that they are there because they are needed for the existence and development of the particular individual at that time. It happens that they resemble similar stages in other and sometimes much simpler creatures, but that does not justify the leap to the conclusion that there is any such connection as would be indicated by a law of cause and as would be indicated by a law of cause and effect between such similar forms. About all, as pointed out by Weismann, "the resemblances between the human embryo and that of the other vertebrates are so superficial that His, W. von Bischof, Karl Vogt, and many other recent and thorough students of comparative embryology, have protested against Haeckel's views regarding these resemblances as phylogenetically significant identities. He concludes "Nothing but gross want of knowledge can excuse a man at the present day in bringing forward this argumentum ex ignorantia in support of the descent of man from beasts." The re-capitulation theory has been a favorite source of arguments in education, the social sciences and other scientific modes on which the theory of evolution was thought to throw great light. On it has been made to depend many of the unfortunate applications of the evolutionary theory. Professor Kellogg suggests that "the recapitulation theory of Fritz Muller and Haeckel is chiefly conspicuous now as a skeleton on which to hang innumerable exceptions »

Conservative Christian views with regard to the origin of man have been still more strongly confirmed by the recent immense developments of the science of archæology and the increase of our knowledge of the story of man's existence, not from theory, but from actual remains obtained in the course of excavation. Under the influence of the theory of evolution as a background of their knowledge the last generation of the 19th century were persuaded that human beings were in process of making wonderful progress which could be traced almost from generation to generation and surely from century to century. Scientific archæology has made it very clear that man at any time in his history when he was interested in any work was capable of doing wonderful things which stamped him as separated by a very great gap from the animal. Succeeding generations of men have often utterly failed to advance above their forebears as we know them by actual remains, but on the contrary degeneration has been at least as common a rule in history as progress. The whole question as to whether mankind has ever made any progress has come up and Flinders Petrie, acknowledged as the authority in Egyptology, does not hesitate to

say that "what strikes us most is how very little man's nature or abilities have changed in 7,000 years, for what he admired we admire; what were his limits in fine handwork are also ours . . . So far as human nature and taste go man is essentially unchanged in this interval."

If man's origin was an act of creation due to the breathing of something Divine that made him like his Creator into his animal body, we might expect to find in him something like this permanency of status. This rather surprising contradiction of the ordinarily accepted idea of facile progress has been strikingly confirmed by the further advance made in archæology in the study of the cave man. The excavations in the Dordogne and in western and southern France and northern Spain have completely contradicted the idea that man began low down in the scale of being, scarcely above the beasts, and gradually climbed up. They have shown on the contrary that the very first man of whom we have any definite records many thousands of years ago was the intellectual and the spiritual brother of man as we know him now.

The scientific fallacy which has traced man's gradual development from a status just above that of the beast to his present high state of civilization has been due to neglect of the real significance of human life. In the utilities man began low down in the scale and had to develop gradually the things that would help him in his physical life. The notion that this was the only side of man that could possibly have been developed in those early days and that his higher esthetic evolution could only come much later was entirely an assumption. It led scientists to conclude that the history of man as a toolmaker and a tool-user represented the progress of humanity What was revealed by the discoveries made in the cave dwellings was that man cultivated first the arts and gave play to his sense of beauty and only later turned to the development of the utilities. Before man was a carpenter and made himself artificial houses to live in, dwelling in the caves that he found so convenient, and before he was a tailor and fashioned his garments to facilitate his work, or a farmer to till the soil and give himself leisure between sowing and harvest, he was an artist and an artistic craftsman whose work now revealed to us commands the reverent regard of the modern world.

When it was first discovered that there were many remains indicating that a number of generations of man had dwelt in the caves of what are now France and Spain the conclusion was jumped to at once that the cave man stage of existence must represent a period in which men were just a little higher than the animals. They were crafty enough to displace the beasts from their lairs in the hillsides and cunning enough to keep them out. Scientists in their eagerness to confirm the theory of evolution went much farther even in this assumption. They represented the cave man as the lowest of savages, quarrelsome, utterly selfish, with no interests except those of his body, ruthlessly ready to fight with his kind on the slightest provocation or even without provocation if he felt that he had the strength or the chance to kill without danger. A favorite theme was that he dragged his female home by violence to keep her as his own, to bear his burdens and

his children, the one saving quality in the picture being his care for his children, though even this was supposed to be neither consistent nor continuous.

This was the supposedly scientific picture of the cave man that was populanzed and the general public has as yet no idea apparently that the discoveries of actual remains in the caves completely contradict this theory. Three modes of ant were found in the caves, the movable art, consisting of various utensils decorated prettily, the mural or parietal art of pictures made on the walls of the caves to which more recent discoveries have added the plastic art of rock sculpture and molded clay. The engravings on bones and horns and sometimes on stone implements revealed that a real artist was at work in this olden time. He was a man who saw clearly and could reproduce with fine fidelity often by means of a very few lines what he saw. His work while primitive was not crude, but anticipated in many ways modern impressionistic art, the latest phase of artistic development. There must have been a good many men of the time capable of doing excellent work in this line for copious remains in many places and even at different horizons, which inducate intervals of generations, have been found.

What as extremely interesting is that the cave man should have tried to make beautiful even the every-day utensils that he handled and that he was willing to spend a good deal of time and care an their decoration. One suggested criterion of cultural advance among men has been that "there is no culture in the hearts of a people until the very utensils in the kitchen are beautiful as well as useful." The cave man judged by this criterion is rather in advance of than behind most of the peoples of history in higher human development. His cave home we have come to recognize especially after trench experience was healthier than the dwellings of the great majority of the human race at the present time, not alone the poor, but even the rich He tried to make his home a place of beauty for himself and has family. If we are to judge by how such a thing comes about in the history of long after times, we should be forced to the conclusion that it was the cave woman who somehow had succeeded in securing the surroundings of artistic quality for herself and the children who had to spend so much more time at home than the cave man himself.

If there had been nothing but the movable art of the caves that in itself when properly appreciated would have completely corrected the notion of the cave man as an any way near to the animals. On the contrary he was a modern man in his interest in beautiful things. The discovery of the parietal or mural art emphasized this very strongly. The walls of the caves were found to be decorated in many places with pictures of the animals which the cave man hunted. The evolution of this art has now been traced and it manifestly began in black and white, that is, the gray wall of the limestone cave as the background for deep lines made with a sharp piece of flint and then filled with lamp black as the outline of the picture. The surprise is to find the boldness and sureness of the drawing, the almost complete absence of corrections and the thoroughgoing confidence with which the cave artist must have made his

pictures. He knew exactly what he wanted to reproduce and there was no halting or hesitation about his line work. Modern artists have not hesitated to declare that some of this drawing must be counted among the best that has ever been done, especially when the circumstances in which it was accomplished are considered.

The cave man was not satisfied with these line drawings vivid and expressive as they are. He wanted to reproduce the colors of the animals as he saw them and succeeded in doing so At first he used only the reds and browns, but after a while also the yellows and many shades of colors His color sense was evidently exactly like ours and he reproduced the animals as he saw them. The reason why his colors lasted so well during all these years is that they were ground in oil. This inventor of oil painting has made some of the most vivid pictures of animals that have ever been made He pictures them in all positions, standing, lying down, in all kinds of movement and at bay He even took advantage of certain somewhat rounded projections of the walls of his cave home to fit his pictures of animals to these surfaces in relief in such a way as to give the impression of plastic work His power to accommodate his painting to the cramped conditions necessary for this, show what fine command he had over his artistic powers The men who did this work far from being close to the beasts are quite as high as the men of our time, indeed if anything on the average higher. It is not at all surprising to find that they were magnificently developed and had a skull a little larger than the average of the men of our time

These pictures were often made on the cave walls at such a distance from the entrance that the darkness was complete. Just what kind of light the cave man used has not been found. It was not torches, for there are no marks of smoke on the walls or ceiling. Sir Arthur Evans, who was president of the British Association for The Advancement of Science, did not hesitate to say in 1916 in his presidential address that the cave man had probably discovered some mode of lighting his cave, or otherwise he would not have been able to do the painting that is actually found there. It would not be surprising if the inventor of painting in oils should have made other inventions. He used fire in many ways and fire is, after all, one of man's greatest inventions.

The savage cave man of theory then so close to the beasts gives place when his actual remains are critically appreciated to a man the equal of any in the history of the race. An artist is at all times the flower of our civilization and evidently many of the cave men were artists. Further discoveries give indications of rather happy domestic life, his wife being pictured as rounded and fat though the cave man himself is muscular and athletic, evidently fitted for the difficult task of hunting the animals. Had his wife been the slave that she is pictured in theory she would not have been anything like the portraits that we have of her. There are manifest signs in some of the drawings of her liking for dress and already in various places there are various fashions with longer and shorter skirts and higher and lower corsages and ribbons and other adjuncts of fashion (Sir Arthur Evans). Above all the

cave man carefully buried his dead with some of their weapons and utensils near them and with other evident indications of his belief that death was not the end of life, but that there was another life. He was perfectly willing to sacrifice some of the finely decorated and well-fashtoned utensils that had taken a good deal of time in the making, in order that his dead ones might have near them in the other world their favorite implements of this In a word archæology has shown us the first man of whom we know anything definitely, as a reasoning being with a highly developed sense of beauty, with a belief in immortality, with feeling for others, with a compelling tendency to surround himself with beautiful things as far as he could and not with that supposed tendency to occupy himself exclusively with utilities which instead of representing development always indicates a tendency at least to degeneration.

The one question that remains then is whether there is room in Biblical chronology for the record of man as worked out by science. Here once more the conservative views of the early Fathers of the Church are extremely important in enabling us to understand what should be looked upon as the prevailing belief in these matters. The supposed incompatibility of science and faith in the matter is entirely due to a comparatively recent misunderstanding of the Scriptures Some of the early Fathers of the Church took the days of creation literally, but the Alexandrian Fathers who faced these problems in true philosophic temper interpreted the days of creation ideally, taking the words of Genesis as a human mode of speech so that men might understand what was expressed in terms of their previous knowledge Such distinguished Christian philosophers as Clement, Athanasius, Cyril and Origen, as well as Saint Augustine, taught that creation was a single act. Augustine as we have seen declared that "the seeds of things" were first created and then went on developing because of the living power put into them.

The Fathers manifestly did not feel that a definite date for the creation of man was set by the account in Genesis. It was Archbishop Usher under post-Reformation influences who first calculated that the creation of Adam was 4004 B.C. Indeed the literal interpretation of the rather vague wording of Scripture with regard to many things is quite modern as a rule. As in the question of a universal deluge, which is not Biblical, more careful study of the scriptural text shows that there is no good reason for any such limitation of time as Usher suggested. There is absolute freedom to discuss the age of man on earth as far older than any such date. Rev. Father Obermaier and Abbé Breuil, to whom we owe more of our exact knowledge as to the cave man and our earliest ancestors than any others, have discussed the probable date of this dwelling in caves very fully Obermaier thinks that 50,000 years might be necessary to include all phases of development that have thus far been unearthed. Abbé Breuil is of the opinion that 20,000 years would be quite sufficient for all that recently discovered facts as to man's development would de-mand. Their opinions deserve the highest con-sideration from students of science. The lower figure is confirmed by the conclusions of Prestwich, a well-known authority on geology, who

limits the time since the Glacial period to 25,000

years and man is surely post-glacial.

Many presume that at least modern science has completely obliterated the old-fashioned notion that man was the center and the culmination of creation for whom other parts were made and to whom their activities were mainly directed. Alfred Russell Wallace, however, in his volume, 'Man's Place in The Universe,' has re-established that old idea on the firmest of modern scientific and evolutionary bases. Surely no one can talk with more authority in the matter than the man who with Darwin discovered the principle of natural selection. Wallace goes so far as to say «and is it not in perfect harmony with this grandeur of design (if it be design), this vastness of scale, this marvelous process of development through all the ages, that the material universe needed to produce this cradle of organic life and of being destined to a higher and a permanent existence, should be on a corresponding scale of vastness of complexity and of beauty? During the whole process of the rise and growth and extinction of past forms the earth has been preparing for the ultimate man—much of the wealth and luxuriance of living things, the infinite variety of forms and structure, the exquisite grace and beauty in bird and insect, in foliage and flower, may have been mere by-products of the grand mechanism we call nature—the one and only method of developing humanity »

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MAN, Isle of. See Isle of Man.

MAN, Prehistoric Races of. The knowledge that there actually were prehistoric "races" of man, physically different from any of the

edge that there actually were prehistoric «races» of man, physically different from any of the racial groups living today, dates back scarcely as far as the middle of the 19th century. Prior to that time the dawn of human existence was commonly assumed, even by many scientific men, to have been coincident with the beginning of recorded history, some 6,000 or 7,000 years ago.

Even Georges Cuvier, the great French paleon tologist of the early 19th century, was intolerant toward the idea that fossil human bones might be found. However, during the second quarter of the 19th century ancient stone weapons were found in western Europe actually mingled with the bones of extinct beasts of the Diluvial Age. Shortly thereafter fossilized human bones were similarly found in the floor of a cave, together with bones of elephant, rhinoceros, and other beasts long extinct in Europe. But these human bones, though very ancient, were not unlike those of modern man. Then in 1856, occurred the epoch-making discovery of Neanderthal man a low-browed creature clearly human but so unlike any known race of man that it was made the type of a new species, and in 1891 remains of Pithecanthropus, the famous «Ape man of Java,» a barely human creature, were unearthed Beginning with the early years of the present century discoveries in this field have been numerous in many parts of the world. These include, first, fossilized bones of ancient men and of the animals they hunted; second, archaeological relics such as stone implements, etc., which yield information regarding the cultural evolution of prehistoric men; and third, advances in geological knowledge which enable us to measure their antiquity and to know the physical conditions of the various periods in which they lived. No fossil bones of ancient man are known from deposits older than the early phases of the Pleistocene epoch, also called the Glacial or Ice Age; though it is generally admitted that the hominid and great ape branches diverged from a common stem during Tertiary time.

This is not the place for a discussion of the Pleistocene epoch or Ice Age, or of the disputed chronologies of its several cold and warm phases, but it may be said that estimates of the total duration of the Pleistocene vary from 500,000 years to 1,500,000, with the weight of opinion favoring a median figure or approximately 1,000,000 years. Most authorities recognize in Europe four periods of lowered temperature with glacial advance, each followed by a warmer interglacial phase. The glaciations are called, beginning with the oldest, the Günz, Mindel, Riss, and Wurm, or simply the 1st, 2d, 3d, and 4th. The second was far the most extensive. The fourth glacial advance is believed to have attained its maximum about 30,000 or 35,000 years ago, so that present time may be considered to be late in the fourth postglacial phase. This article will be devoted chiefly to brief

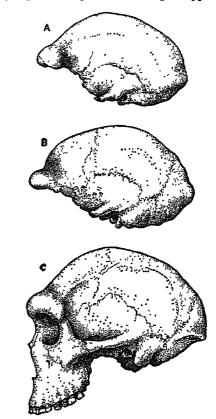
discussions of the various prehistoric types thus far known, stressing their physical features and their inferred relationships. Archaeological evidence will be touched upon only incidentally as it has little bearing on questions of race. A number of discoveries, which for one reason or another do not seem to be important, will be omitted.

It seems best to begin with earlier and more primitive races; then to discuss those which are somewhat more advanced but still below the level of *Homo sapiens*, which will be treated last. Discoveries of prehistoric types are usually sporadic and accidental and in many or most cases the material is fragmentary and incomplete. It must be admitted that actual knowledge of phylogenetic relationships and genealogical successions of these ancient human types is extremely meager and tentative, but it is growing steadily as new evidence is brought to light. It is important to realize clearly that these ancient human «races» were not limited in their geographic distribution to the particular region where the known fossil specimens were found, and also that the chronological range of such races and species probably comprised many tens

of thousands of years in every case.

Ape Man of Java (Pithecanthropus erectus). -The most primitive member of the human family thus far discovered is widely known under the names of «Trinil man» and the «Ape man of Java » In 1891-92 Dr. Eugène Dubois of Holland unearthed in the dry bed of the Solo River near the village of Trinil in central Java, a fossilized upper part of a cranium, two molar teeth, and a thigh bone. All these fossils were clearly of primate character and Dubois believed them to be parts of a single individual thigh bone was essentially manlike, though with some peculiar features. The cranium was very small, depressed in form with an extremely low, narrow, and retreating forehead with a prominent ridge above the eyes. The cranial capacity is now known to be about 940 cubic centimeters, which is barely within the minimal limit of normal human cranial volume, but far in excess of that of any ape. The form of the brain is also essentially human and markedly unlike that of any ape. Dubois, believing that his Javan discovery represented the realization of a hypothetical missing link which had been postulated in 1868 by Ernst Haeckel and called by him Pithecanthropus alalus (speechless ape man), adopted this name for the genus of his Javan find, but substituted the specific name erectus in view of the fact that the form of the thigh bone showed that its possessor walked upright. Dubois characterized the creature as a «manlike transition form» and «the precursor of man» The fossils were later brought to Holland where they naturally aroused world-wide in-terest and evoked spirited discussion. Some authorities held that they belonged to an ape, but a more manlike ape than any hitherto known; others considered them the remains of a lower type of man; while a third group agreed with Dubois that he had discovered a transitional form or «missing link.» The two molar teeth have been shown recently to belong to an extinct Javan orangutan. As for the femur, though the association with the skull is not certain, there are no facts which preclude it. For 45 years the Dubois discoveries comprised the sum total of evidence regarding Pithecanthropus, but from 1936 to 1939 three additional crania and portions of a palate, a lower jaw, and several teeth of this type were found in Java by G. H. R. von Koenigswald. One of these was the fossilized cranium of a child of about two years, the low forehead of which already shows the beginning of a brow ridge. Further explorations yielded two adult skulls, one of them almost identical in form with the Dubois skull but more nearly complete and somewhat smaller, with a cranial capacity estimated to be under 850 cubic centimeters, considerably below any normal human skull. In general, it may be stated that Pithecanthropus erectus is the most primitive member of the hominidae thus far discovered, barely human and perhaps too apelike to merit in-clusion in the genus Homo. H. de Terra, who has made extensive correlation studies of the Asian and Javan Pleistocene, believes that Pithecanthropus had a range from very early Pleistocene times, perhaps 600,000 years ago, to the second pluvial (equivalent to the European second glacial) and possibly the second interpluvial If this is correct, the Pithecanthropus group may have existed for 200,000 years or even longer Java was at that time, or had been earlier, an extension of the Asian mainland, part of a larger Malay Peninsula, so that Pithecanthropus may be considered essentially a southern Asian form. There is no indubitable evidence as to the culture of these primitive hominidae, but it is known that Peking man, a type only slightly more advanced, fashioned stone implements of a crude sort

The important question regarding Pithecanthropus is. Does he represent an ancestor of any higher human type or does he exemplify merely the end of an early hominid branch which died out? A few years ago many authorities favored the latter alternative, but the discovery of the closely similar Peking man and the recent finding of the somewhat more advanced Solo man in Java (both described below) lend probability to the view that Pithecanthropus may represent a precursor of higher types.



Three primitive skulls drawn to same scale. Ape man of Java (Puthecanthropus erectus). Second adult skull, found 1937.

Peking man (Sincethropus pekinensis), Skull found 1929. Rhodesian man (Homo rhodesiensis), Africa. Skull

Peking Man (Sinanthropus pekinensis).-For many years certain paleontologists have recognized evidence indicating that the human

and simian branches diverged from a common stem during Tertiary time, probably in Asia. Many genera of fossil anthropoids are known from Miocene and Pleistocene formations in India. In 1927 a well-preserved fossilized hominid molar was found in cave deposits at Choukoutien, 37 miles southwest of Peking. On the sole basis of this tooth the late Dr. Davidson Black proposed a new hominid genus and species which he named Smanthropus pekmensis (Chinese man of Peking). This apparently rash venture in taxonomy was soon vindicated by the discovery (1929-30) of two nearly complete crania and several jaws and teeth almost as primitive as Pithecanthropus. The Choukoutien remains are found in a series of clefts or fissures in Ordovician limestone which represent the remains of a cave of Middle Pleistocene time which was frequented by these early hominids and also by various animals. Geological and paleontological evidence indicates that these cave deposits are perhaps a little later than the Trinil zone of Java Their age probably corresponds to the second glacial advance in Europe with an estimated antiquity of some 500,000 years. Professor Black published a splendid series of studies of Peking man but unfortunately he died in 1934. He had a most able successor in Prof. Franz Weidenreich who has continued the explorations at Choukoutien and published many masterly reports on the material. In all, five fairly complete skulls had been found up to 1936, together with many jaws and teeth but very little of other skeletal parts. The remains tound represent probably not less than 40 individuals. There is convincing evidence that most of these people were killed and the severed heads carried into the cave. All of the skulls had been broken open at the base apparently for the extraction of the brain, giving reason to suspect that Peking man practiced cannibalism He certainly had mastered the art of making fire, fashioned extremely crude implements of chipped stone, hunted deer and other animals, and utilized lower jaws and pieces of deer antier as tools. Hackberries were carried into the cave and cracked to extract the kernels The Smanthropus skulls have a small but variable endocranial capacity; one of them measures only a little over 900 cubic centimeters or about the same as Pithecanthropus. But others are larger, the largest measuring 1,200 cubic centimeters, thus being well within the normal range for Homo. The extremely depressed vault and similar heavy brow ridge give the skulls a striking resemblance to Neanderthal man, but in one particular they are remarkably like Pithecanthropus: namely, in the fact that the cranium is widest near the level of the ears and becomes narrower higher up in the region where the brain case of Homo is widest. There is no chin prominence and the teeth are definitely primitive. It cannot be asserted positively that Sinanthropus was an ancestor of any later type but, as Professor Black asserted, ats dental characters certainly seem to indicate that Sinanthropus could not have been far removed from the type of hominid from which evolved both the extinct Neanderthal and the modern Homo sapiens.» Later researches have fully confirmed this view.

Professor Weidenreich, the leading authority on Peking man, holds the opinion, based on certain features of cranium, jaws and teeth, that the Mongoloid branch of recent man is more closely related to Smanthropus than are the Whites or Negroes.

Heidelberg Man (Homo heidelbergensis)—A human lower jaw found in 1907 in a sand quarry at Mauer near Heidelberg, Germany, Germany, remains the most primitive and the oldest human skeletal relic found in Europe with the somewhat doubtful exception of Piltdown man, to be considered later. The jaw was found at a depth of 79 feet below the present surface, at the very bottom of a 50-foot layer of ancient river sand which for years had yielded fossilized bones of many species of early Pleistocene animals, notably the straight-tusked elephant, the Etruscan rhinoceros, and the lion. There is some difference of opinion as to the exact geological age of these fossils, including the human jaw. They cannot be later than the second interglacial (Mindel-Riss) interval, and recent paleontological studies tend to place them as early as the first (Gunz-Mindel) interglacial which, if true, would date this jaw as early as the known finds of Pithecanthropus and earlier than Sinan-thropus. However we must not overlook the possibility that the chronological ranges of these three types may have overlapped. The Heidelberg or Mauer jaw is extremely massive, the chin prominence is entirely lacking, and the ascending branch is broader than in any known human jaw, but, despite absence of chin, all the essential features are definitely human. The form of the dental arch is completely manlike, not at all apelike, and even the chimless front of the jaw is quite different from the corresponding part of an ape. The teeth are rather small for so massive a jaw, and the canines are no larger than in many modern men. Comparing it with the other very early hominid types, we find that some of the jaws of Peking man approximate it rather closely, though the teeth of Peking man are definitely more primitive. The recently discovered jaws and teeth of Pithecanthropus also seem to be less completely human. Prof. O. Schoetensack of Heidelberg, who described the specimen in 1908 and named it Homo heidelbergensis, advanced the view, which has been very generally accepted, that Heidelberg man represents an ancestral pre-Neanderthal type or as H. F. Osborn expresses it, «a Neanderthal in the making.» Other respectively. paleontologists, considering the Heidelberg type too primitive to be included in the genus Homo, later proposed such generic names as Palaean-thropus and Protanthropus, but the original name given by Schoetensack is almost universally used. No artifacts are definitely associated with Heidelberg man, but it is inferred that at best he may have attained to the pre-Chellean or Chellean culture level. There is surely no reason to believe that he had not advanced at least as far as Peking man. The famous jaw of 1907 remains the sole relic of Heidelberg man but its importance has been greatly enhanced by the discovery, more than 20 years later, of the probably closely related Peking man and the new material of the Javan Pithecanthropus, These three types, all of rather early Pleistocene times, representing the oldest and most primi-tive members of the human family, may well be grouped as protanthropic hominids. Their distribution accords with the view that various prehominid stocks radiated from a region in central or south central Asia, such as northern

India where Miocene and Pliocene rocks have yielded many fossil anthropoids. Another form, possibly but doubtfully belonging with these protanthropic men, is represented by two badly fragmented skulls found by L. Kohl-Larsen in 1935 in northern Tanganyika, East Africa The more nearly complete of these skulls has been restored by Weinert (1939) in such fashion as to give it a close resemblance to Pithecanthropus and Sinanthropus. He named it Africanthropus njarasensis. The geological incidence is uncertain but it appears to be late Pleistocene, long after the time range of any of the three protanthropic types discussed above, and the inclusion of "Africanthropus" in that group on present evidence does not seem to be warranted It may be noted that several kinds of fossil anthropoid apes have recently been found in Africa, including several which are much more manlike, as indicated by their skulls and teeth, than any living apes, though they and teeth, than any living apes, though they are geologically too late to have a possible place in the ancestral line of any human type. The fact that the three somewhat similar protanthropic types (Java, Peking, and Heidelberg) were widely scattered toward the periphery of the great Eurasian land mass early in Placy toward type (with the "A fracouthropic place). in Pleistocene time (with the "Africanthropus") in Africa as a very doubtful fourth), all of them in regions later inhabited by more advanced human types, suggests that the differentiation of man into the chief ethnic divisions known today, namely the black, yellow-brown, and white, may have preceded the attainment of the Homo sapiens status

According to this concept the species *Homo sapiens* does not represent the collective progeny of a single primitive hominid stem which secondarily branched into several races as has commonly been assumed, but rather a composite species, a synthesis of three or more primary protanthropic types, the progeny of none of which persists in pure form today. All modern "races" show intermingling, some much more than others. Numerous competent ethnologists

favor this view.

Neanderthal Man (Homo neanderthalensis, King 1864) = (Homo primigenius, Wilser 1897).—This was the first ancient type to gain recognition as a species distinct from Homo sapiens. The discovery which led to this identification and on which King's specific name is based was made in 1856 It consisted of the top of a skull and a number of other bones which were dug up in the floor of a limestone cave in a small ravine known as the Neanderthal (Thal — valley or ravine) near Dusseldorf, Germany. The bones showed a number of unusual features, the skull especially being remarkable for its depressed yault, low, retreating forehead and heavy cornicelike ridge overhanging the orbits. For some years it was variously regarded as the skull of an idiot, as a pathologically deformed specimen, and as belonging to a "barbarous and savage race." But it was recognized as a distinct human species in 1864. It is a remarkable fact that a female skull of the same species found in a cave at Gibraltar in 1848, eight years before the Neanderthal discovery, remained practically unknown until 1907 when it was shown to be of the Neanderthal species, of which by that time a number of other remains were known. Neanderthal man is now by far the best known of all types of Pleistocene humanity. His remains, chiefly from limestone caves and rock shelters, are in many cases thoroughly documented by the bones of contemporaneous animals and by associated stone implements of the Acheulean and especially of Mousterian culture which represent his handiwork. Germany, Belgium, France, Croatia, Spain, Italy, and recently Palestine have all yielded skeletal material and Mousterian implements, and the latter are also known in North Africa. A recent discovery of especial importance is a practically complete skull of a Neanderthal child of about eight years, together with other parts of the skeleton and Mousterian tools found in 1939 in a cave in southern. Uzbekistan in central Asia. The particular significance of this find is that it extends the known range of Neanderthal man much farther eastward, and indicates that he was Eurasian rather than merely European. As stated above, Heidelberg man has commonly been considered a pre-Neanderthal form but the much more completely known Peking man is at least as well qualified to be a Neanderthal precursor. The site of the Uzbekistan discovery in central Asia is geographically almost exactly midway between Peking and Heidelberg.

Until rather recently Neanderthal man was

supposed to represent a single type, especially identified with the fourth or Riss glacial epoch and with the Mousterian flint industry. This and with the Mousterian flint industry. group, which we may call the "typical" Neanderthal form, is represented by the original Neanderthal specimen, two skeletons from Spy, Belgium, and the skeletons from Chapelle-aux-Saintes, Le Moustier, La Ferrassie and other well-known examples from France and other parts of western Europe. These typical Nean-derthals are all heavily built and of short that we should be a short that we should be a short that and the short that the short tha stature, usually not more than five feet, three or four inches, the females somewhat less In general, the bones are extremely massive. The skull is of strikingly unique form with a depressed vault, a low, retreating forehead and an especially notable feature is the heavy supra-orbital ridge, very similar to that of Peking man. The cranium, however, is usually large, in some cases with a capacity well above the average of modern man, though some female skulls are rather small. The cheek bones slope obliquely backward and the depression in the cheek region known as the canine fossa is lacking. The orbits are round and extremely large. The nose must have been prominent, not flat-tened, but extremely wide. The mastoid proc-esses are very small. In back view the cranium has a peculiar form which has been described as «bun-shaped.» The lower jaw shows no chin or the merest suggestion of a chin. The teeth are large in general but the canines are not relatively so. A peculiarity of the molars in many cases, especially the lower molars, is an enlargement of the pulp cavity which extends downward into the conjoined roots, a dental form called «taurodont» (bull-tooth) by Sir Arthur Keith. This condition was also sometimes present in the much earlier Peking man. All in all, the Neanderthal skull is so distinctive in almost every feature that it can be identified at a glance. Several other parts of the skeleton show characteristic features but these are not so striking as those of the skull Study of the skeleton gives no warrant for describing the Neanderthal people as walking semiupright and

as having enormously thick, gorilla-like necks and imperfectly opposable thumbs, as some writers have pictured them. The massiveness of the limb bones is marked and the forearm and shin bone are short in comparison with arm and thigh. The hands and feet were almost as in modern man. As regards cultural status, the phase of Paleolithic flint industry known as Mousterian, with its skillfully made axes, scrapers, spearheads, borers, etc., is definitely associated with Neanderthal man. Remains of ancient hearths show that these people possessed the art of making fire, probably an inheritance from protanthropic ancestors, and in a number of cases the dead had been given careful ceremonial the dead had been given careful ceremonial burial in caves and rock shelters, together with flint implements and parts of the bodies of animals, evidently intended for the use of the departed. Neanderthal man has usually been identified with the fourth (Wurm) European glacial, but a number of skeletal remains of this type are those of earlier people who are known to have lived during the third interglacial epoch. Examples of these are the remains glacial epoch. Examples of these are the remains found in the region of Weimar and Ehringsdorf in Germany, the remains from Krapina in Croatia, and three skulls recently found in Italy The earlier age of these remains is indicated by geological conditions and in some cases by associated flint implements of the Acheulean culture phase. Some of these are believed to be probably 75,000 to 100,000 years old. A skull found in 1933 at Steinheim, a few miles north of Stuttgart, Germany, is especially puzzling. It is apparently a female skull, obviously Ne-anderthaloid in general, but it is the smallest known skull of that type and in a number of important features it deviates notably from the Neanderthal cranial pattern and in a few particulars it even approximates *Homo sapiens* This is the more remarkable in that it is clearly of the Riss-Wurm interglacial age and thus very much older than the typical Neanderthals. As some of the cranial and dental features of Neanderthal man are regarded as exhibiting specialization or even degeneration it is possible that the Steinheim specimen may represent an early and more generalized phase in the evolution of that type.

In 1925 a portion of a Neanderthaloid skull was found near the Sea of Galilee in Palestine and in 1932 and shortly thereafter, in a group of three caves at the foot of Mt. Carmel, at least 10 skeletons were found, all or most of them representing intentional burials. Careful study of these remains by Theodore McCown and Sir Arthur Keith shows that while some of them are predominantly Neanderthal, others, apparently of the same period, exhibit a remarkable mixture of Neanderthal and Homo sapiens characters. This mixture of characters constitutes a perplexing problem. McCown and Keith believe it represented a rapid local evolution of the sapiens type from the Neanderthal, but another suggested explanation is that the Mt. Carmel population lived at the boundary where two races, already differentiated in different regions, happened to come in contact; but if that is true, the origin of the «higher» type is a problem.

The fate of Neanderthal man is unknown. We know that this race survived until some time after the maximum of the fourth or Würm glaciation, but at a time estimated to have been some 25,000 to 30,000 years ago Neanderthal

man seems to have disappeared as a specific type and to have been superseded by Homo sapiens, Unfortunately, notwithstanding abundant speculation, scarcely anything is definitely known regarding the ethnic origins of our own species perhaps less than is known about the origin of Neanderthal man, for in the latter case there are at least the Peking and Heidelberg types which represent possible ancestors. It was long believed very generally that the Neanderthals were exterminated by early examples of Homo sapiens who invaded Europe from Asia or possibly northern Africa bringing with them the Aurignacian culture, but there is no evidence of such a superior race inhabiting these countries at so carly a period. Besides, we know now that the range of the Neanderthals included central Asia as well as Europe Even on the theory of invading conquerors there would probably be some racial mixture, and a number of ethnologists are convinced that some of the Europeans of early postglacial time show evidence of Neanderthal inheritance. One early type of *Homo supern* fossilis, sometimes cited as exhibiting this, is the so-called Brunn race, named from a Late Paleo-lithic site of discovery in Moravia. These were long-headed people with rather prominent superculiary ridges on the brow, but any special relationship to the Neanderthal man is very questionable. At the present time some competent authorities reject the theory of an invading superior race and hold the opinion that Homo sapiens represents a direct evolution from Neanderthal man, but this proposition has not yet been demonstrated. One apparent obstacle to the acceptance of such evolution in Europe is the suddenness of the transition. There are no really well-marked intermediate types. In Europe during the Late Paleolithic culture phases several varieties of *Homo sapiens fossilis* existed. One of the older was the so-called Brunn type already mentioned Another, known from only two skeletors buried in a cave per from only two skeletons buried in a cave near Monaco and called the Grimaldi race, was be-lieved to be an early negroid type, but it has been shown recently that they probably represent a variant of the Cro-Magnon race. The name Cro-Magnon was first applied to a group of skeletons found in the Dordogne in France in 1868, which were believed to represent a well-defined race of tall people marked by high, capacious cranium, vertical forehead, narrow nose, and prominent chin. With this fine physical type is associated the superior flint implements, carvings, engravings, and cave paintings characteristic of the Solutrean and Magdalenian phases of Late Paleolithic culture. Later studies have demonstrated, however, that the population of Europe in Late Paleolithic showed great variation so that the name Cro-Magnon should probably be used, if at all, in a much more inclusive sense. Prof. F. A. Hooton of Harvard, who has sense. Prof. E A. Hooton of Harvard, who has given much attention to the study of Late Paleo-lithic Europeans, states that he is «so unregenerate as to be sceptical of the reality of the Cro-Magnon race if the term 'race' be used in its proper anthropological connotation.» G. M. Morant, on the basis of craniometric studies, concludes that «the Upper Paleolithic type is modern in almost all respects . . . it resembles . . the modern dolichocephalic races of western Europe and there can be little doubt that the latter population is directly descended from the earlier.»

Rhodesian Man of Africa and Solo Man of Java.-Two examples of ancient hominids remarkable for their similarity, notwithstanding the fact that they inhabited widely separated regions, are (1) the Rhodesian man (Homo rhodesiansis), known only from a single skull and a few bones found in 1921 in northern Rhodesia, and (2) Solo man (Homo soloensis), represented by eleven crama and two tibiae discovered between 1931 and 1936 in central Java near the village of Ngandong on the Solo River, only six miles from Trinil where Dubois found the first Pithecanthropus skull 40 years earlier. Until the Solo discoveries the Rhodesian man seemed utterly unique, isolated and problematical, but Solo man is so similar in cranial characters that the close relationship of the two types seems beyond question. Of the Solo skulls only the cranial regions were found and all of them had been broken open at the base, apparently for the extraction of the brain, exactly as in the case of Peking man, another example of primitive head hunting or cannibalism. The Rhodesian and Solo skulls show such striking superficial resemblance to Neanderthal man in the low vault, retreating forehead, and heavy brow ridge that some persons consider them to be aberrant African and Javan examples of that type, but the similarities are outweighed by many impressive differences. The apparent likenesses impressive differences. The apparent likenesses are merely examples of what the zoologists call «parallelism.» The cranial capacity is low, in most cases well under 1,300 cubic centimeters. The Solo type which de Terra places in third interpluvial (interglacial) has every appearance. of being a true descendant of Pithecanthropus, just as the Neanderthals of Europe and Asia probably evolved from the early and more primitive Peking and Heidelberg types G. H. R. von Koenigswald, who has made careful studies of Solo man, concludes that «we have in Homo solvensis the oldest . . . known representative of Homo sapiens fossilis.» (The context of this statement indicates that he would include Rho-desian man) The Solo and Rhodesian men seem to represent an ancient proto-Australoid stage, a sort of transitional form between Pithecanthropus and the later Australian aborigines. Two well-preserved skulls of late Pleistocene age found in southern Australia lend support to this view. One of these is the «Talgai skull» from Queensland, the other the «Cohuna skull» found in Victoria. These are definitely of the same racial type as the modern Australians but more primitive and apparently closer to the archaic proto-Australoids of the Solo-Rhodesian type. No subhuman primates, living or fossil, are known from Australia, and it is practically certain that man of proto-Australoid type migrated to that continent fairly late in the Pleistocene epoch Java, the home of Pithecanthropus and Solo man, also produced in late Pleistocene time a more advanced type discovered by Dubois at Wadjak in 1889 but not described by him until 1921. The type, based on two extremely massive skulls, was named *Homo wadjakensis* and was placed by Dubois as a proto-Australoid type, but G. Pinkley has shown that the supposed Australian relationship is dubious. There is a possibility that the Wadjak man is Neolithic. Africa has yielded during recent years a number of skeletal remains of late Pleistocene age which clearly belong to Homo sapiens but none of these can be definitely related to the

Rhodesian man Several from South Africa (eg, the Boskop skull) show such striking likeness in head form to the modern African Bushman as to indicate direct descent of the latter from them, but the ancient skulls are very much larger, which suggests that the Bushman has undergone degeneration in size since late Pleistocene time. Other fossil skeletons, chiefly from East Africa, show unquestionable relationship to the true Negroes. Thus the evidence, scattered and fragmentary though it is, indicates that the true African Negro and the Bushman were distinct types of *Homo sapiens* as long ago as late Pleistocene time

Piltdown Man (Eoanthropus dawsoni).-Some species of a human cranium and a part of a lower jaw found in ancient river gravels at Piltdown in Sussex, England, in 1911-12, have evoked more controversy and more legitimate difference of opinion than any other discovery relating to early man. The cranial fragments are essentially those of *Homo suprens*, their most remarkable feature being their unusual thickness, but the lower jaw, consisting of almost the complete right half and containing two teeth, is strikingly apelike in the chin region and somewhat so in the form of the molars, so apelike, in fact, that had it been found alone, it would undoubtedly have been considered the jaw of a fossil ape. (No fossil apes are known in England but jaws and teeth of large fossil apes, somewhat different from the Piltdown specmen, have long been known from Miocene formations in France and Germany.) Sir Arthur Smith Woodward, convinced that the Piltdown jaw belonged with the cramium despite its apelike character, united these fragments to constitute the type of a new genus and species, Eoanthropus (dawn man) dawsoni. The association of jaw with cranium as a single type received apparent confirmation from a second discovery in 1915, some two miles from Pilt-down, in which a lower molar, practically identical with the corresponding tooth in the famous jaw, was found with some cranial fragments very like the original skull. Unfortunately the geological age of the Piltdown gravels is somewhat uncertain, though competent opinion now places them as early Pleistocene. Many authorities believe the skull to have belonged to a later period and to have become accidentally mingled, perhaps during a freshet, with older gravels and fossils of various ages. The proponents of the Dawn man theory hold, on the other hand, that the Piltdown cranium is not Homo sapiens but a vastly older and perhaps ancestral type, an early hominid in which the brain (about 1,240 cubic centimeters) had developed far in advance of the jaws which had not yet progressed beyond an apelike ancestral condition. It may be said in general that the circumstances of the discovery tend to support the validity of Eoanthropus, but the fact remains that the association of the apelike Jaw with a cranium essentially of Homo sapiens type seems grotesquely incongruous. British authorities tend in the main to accept the authenticity of the Dawn man, while many in Continental Europe and America are sceptical, favoring the theory of fortuitous association. It may be remarked that bones and teeth of various other animals were found in the same layer. There is much to be said on both sides of the Piltdown question, which is fully presented in some of the works listed in the bibli-

ography following this article.

Prehistoric Man in America.—This subject can be very briefly treated here as it is now generally admitted that all the American aborigines of both North and South America belong racially to the Mongoloid division of Homo sapiens and that their ancestors came from northeastern Asia (Siberia) to Alaska in the region of Bering Strait after the maximum of the last Pleistocene glaciation. Some probably came by land during a period when there was a land bridge connecting the two continents; others may have traveled over the ice or even by boats. There were probably many migrations at dif-ferent times, during a long period, but there is wide divergence of opinion as to just how old the earliest evidences of man in America are. Skeletal remains believed to be of the late glacial or early postglacial age have been reported from Florida, Minnesota, California, and from sites in South America but they are all of the Amerindian type and the evidence for their great antiquity is not universally accepted Apparently much older than any skeletal discoveries thus far made are certain ancient stone points of highly skilled workmanship known as "Folsom points" since they were first found near Folsom, N M, in 1925. More recently they have been found in other regions of the Southwest, and stone spearheads found mingled with bones of mastodon, elephant, and other long extinct animals show that early Americans hunted these mals show that early Americans hunted these long extinct creatures The Folsom culture is believed by geologists and physiographers to be at least 10,000 years old and probably considerably older, which places the early immigrants from Siberia to Alaska still earlier, perhaps by several thousand years. In general the anthropologists seem to be content with less imanthropologists seem to be content with less impressive chronologies than are the geologists In any case it is certain that the Mongoloid branch of Homo sapiens, like the white and black divisions, was fully differentiated before the first migrations from Asia to America which oc-curred probably in late Pleistocene time.

See also Anthropology; Anthropometry; Archaeology; Civilization, Ethnology; Indi-

ANS, AMERICAN; STONE AGE.

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portant discoveries, references to which may be found in the general works named above.

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MAN WITHOUT A COUNTRY, The. Few, if any, short stories written with a purpose have achieved that purpose so completely as did "The Man Without a Country," by Edward Everett Hale. Written during the Civil War, it did much to inculcate patriotism at a critical period in the fortunes of the Umon. The story centers about Philip Nolan, a heutenant in the army of the United States, who came under the influence of Aaron Burr, foreswore his country, and as a punishment was condemned never again to hear its name To effect this, he is kept prisoner all through his long life, first on one ship, then or another, until at last he dies during the Civil War. Though the idea of life-long imprisonment on shipboard is in itself novel and striking, and the naval setting is worked out with remarkable attention to detail, the chief interest of the story lies in the development of the character of the hero, who, from hating his country, grows through suffering to love her with passionate devotion All this is told so convincingly, with such a mingling of fact and fancy and with such a wealth of contemporary allusions, that thousands of readers believed it to be an account of fact. The germ of the plot was suggested to the author through the reading of Scott's Life of Napoleon. It occurred to him that if Napoleon had been passed from ship to ship instead of being confined on Saint Helena, England would have been spared much contumely and the French would not have turned Saint Helena into a shrine. The «local color,» which adds so much to the story, was gained from reading the records of the navy and the proceedings in the trial of Aaron Burr. Immediately upon its publication in the Atlanta Monthly of December 1863, 'The Man Without a Country' became famous, was copied everywhere and was soon translated into foreign languages. It remains one of the most famous of American short stories, and among all the author's voluminous publications is the one most likely to retain its place in literature.

MARION TUCKER.

MAN-OF-THE-EARTH, a local name in the Southern States for *Ipomoea pandurata*, the wild sweet potato vine. A hardy perennial, it is sometimes used for clothing stumps, fences, etc. Generally, however, it is a pernicious weed. The name is also applied to the wild cucumber, *Enchinocystis lobata* See also Ipomoea; Morning Glory.

MAN-EATER, a term applied to any fierce animal which has acquired, or is believed to have acquired, a habit of killing human beings as food. Lions, tigers, leopards and other great cats are accused of it, and undoubtedly many of these beasts, finding how easily a man or woman among East Indian or African villagers may be struck down or seized when sleeping in a flimsy hut, make their lairs near settlements and for a time regularly subsist upon human victims. Such are sometimes, but not always, old cattle-thieves, whose teeth are worn, and which feel unable or unwilling to undertake the exertion of tracking and pulling down wild animals; but this is not always the case. When

such a beast has taken his residence in a district no pains must be spared to kill him, for he will not cease his depredations Horses, elephants camels, etc, sometimes become man-eaters in effect, understanding and exercising their power over him for harm

A man-eater shark is the great white or blue shark (Carcharodon carcharias), which is one of the largest and most formidable of fishes

See SHARKS

MAN IN THE IRON MASK, The. See Iron Mask, the Man with the

MAN AND NATURE, a work of great Marsh (qv). Its full title was 'Man and Nature, or Physical Geography as Modified by Human Action.' The work became at once a standard with international recognition; a considerably enlarged Italian edition was issued at Florence in 1870; and a second American edition, with further changes, appeared in 1874

MAN AND SUPERMAN. In his subtitle Bernard Shaw announces this work as "A Comedy and a Philosophy"; he might, with equal pertinence, have added "A Sermon on the Dangers of Romanticism and a Treatise on Biology, Anthropology and Social Psychology." It is all these and it is, none the less, a successful play which has been greeted with almost continuous explosions of delighted merriment by theatre audiences on both sides of the Atlantic and has entertained still larger audiences in its printed form. The accepted canons of dramatic criticism break down before the audacious genius of a Bernard Shaw; as his American biographer, Archibald Henderson, "He violates all the rules yet turns the trick »

That 'Man and Superman' is a thesis play goes without saying The difficulty is that there are so many theses, so brilliantly, keenly and yet paradoxically expounded, that one leaves the playhouse, or lays down the book, in a state of high mental exhilaration tempered with an irritating sense of mental confusion. The main theme is, however, easily distinguishable; it is the contention, presented also in several other of Shaw's plays (notably 'The Philanderer,' 'You Never Can Tell' and 'Misalliance'), that in the perennial love chase it is woman, driven by the Life Force, who is the pursuer and man, the quarry. This content is a made to some more averetically the tention is made to seem more arrestingly un-orthodox by associating it with the Don Juan story In the preface, addressed to the well-known English critic, Mr. A. B Walkley (who figures in the prologue to 'Fannie's First Play' as "Trotter"), Shaw says, "You once asked me why I did not write a Don Juan play . . . The day of reckoning has arrived: here is the play!" The modern Don Juan as represented by the here John Ton-Don Juan as represented by the hero, John Tanner, is, however, no romantic libertine but a social revolutionist, irreproachable in his private conduct, but implacable in his revolt against false and outworn conventions, determined to save himself from the bondage of love and marriage, but succumbing in the end to the in-exorable demands of the Life Force as exempli-fied by Ann Whitefield The half dozen other characters are sharply drawn: Octavius, the lover for love's sake; his sister, Violet, who conducts her love affairs on business principles;

Hector Malone, the straightforward young American who sees only black and white; his millionaire father, hard-headed and soft-hearted, Roebuck Ramsden, orthodox Philistine; Mrs Whitefield, the helpless and bewildered mother, and, best of all, 'Enry Straker, chauffeur and "New Man." The dialogue is Shaw at his best and there are no long monologues as the strictly philosophical discussion of the theme is segregated in the third act of which Shaw himself says—again in the preface—
"I have . . . thrust into my perfectly modern three-act play a totally extraneous act in which my hero, enchanted by the air of the Sierra, has a dream in which his Mozartian ancestor appears and philosophizes at great length in a Shavio-Socratic dialogue with the lady, the statue and the devil »

By many critics 'Man and Superman' is regarded as Shaw's most important play since it combines some of his most cherished philosophical and social theories with the elements of popular success. It has been customary to identify Shaw himself with the character and opinions of Tanner, and Granville Barker, who played the part in the original production, was actually made up to resemble Shaw who, however, asserts that he had a certain popular Socialist orator in mind as Tanner's prototype. The play was first produced in May 1905, under the direction of Vedrenne and Barker, at the Court Theatre, London, where so many other Shaw plays have been introduced to the public. Its first American production was in September of the same year at the Hudson Theatre in New York with Robert Lorraine as director and also playing the part of Tanner. In the acting version the Don Juan interlude is always omitted but it has been given separately at the Court Theatre in London. For critical reference see bibliography given in article on Candida; also Dickinson, Thomas H, 'The Contemporary Drama of England.

MAN-OF-WAR, an armed naval vessel regularly employed in the service of a government for war purposes.

MAN-OF-WAR HAWK, or FRIGATE-BIRD, a tropical web-footed bird (Fregata aquila), of the family Pelecanida. The color of the adult bird is shining black, glossed with green, the female being duller in hue. Includ-ing the long tail the male bird reaches three feet in length, but the body is extremely small. The bill is longer than the head, strong, hooked at the point and sharp. In proportion to their size their wings are longer than in any other bird and have an extent of seven feet or more. Their flight is so powerful that they are seen more than a thousand miles from shore. move with great difficulty on land, and rarely alight on the water. Possessing great strength and superior power of wing, the frigate-bird pursues terns or gulls which have secured a fish, and by beating them with wings and beak forces them to drop or disgorge it; then seizes the prey before it reaches the water. It also catches flying-fish for itself. Its usual locality for breeding is the summit of some rocky cliff, but breeds among trees where there are no rocky shores, making a rough platform of sticks. There is only one chalky white egg. This species is found throughout the tropics

and a second species (F minor) ranges about the Indian and South Pacific oceans

MAN-YOSHU, man-yō-shoo', or MANY-OSHIU (Japanese, Collection of One Thousand Leaves), Japanese anthology, the most ancient in the language. It is believed to have been completed early in the 9th century, it comprises about 4,000 poems which form a valuable index to the history, customs and literary attainments of the time. Among its hundreds of authors the most able are Hitomaro and Akahito. The poems form a record of about 130 years covering the latter part of the 7th and the early part of the 8th centuries.

MANACLE ROCKS, England, a dangerous reef on the south coast of Cornwall, not far from Lizard Head and seven and one-half miles from the town of Falmouth. They are barely visible, except at low water, and there is no warning of their presence to the mariner except a bell buoy. Many wrecks have occurred here.

MANAGER, City. See CITY MANAGER, PLAN OF GOVERNMENT.

MANAGUA, ma-na'gwa, Nicaragua, (1) the capital of the state, near the southwest shore of Lake Managua, 32 miles south-southwest of Leon, consists of long rows of huts, and a large square lined with houses of two stories. The centre of the square is occupied by a large church, and there is another large church with a conspicuous white arched portal. The inhabitants, chiefly Indians, are industrious A railway connects Managua with Corinto on the Pacific. Pop. about 60,000, (2) the lake, about 38 miles long, discharges itself into that of Nicaragua, above which it has an elevation of 16 feet, while its elevation above the Pacific is 156 feet. It has attracted a good deal of attention in connection with a proposed navigable communication between the Atlantic and Pacific.

MANAKINS, a rather undefined group of South American tropical birds, mostly of the family Puprida, related to the North American tyrant-flycatchers. They are small, brightly colored (but the females are usually much plainer than the males), and the wings often bear curiously modified and often highly ornamental feathers. They are of terrestrial habits, staying upon or near the ground in wooded places, clinging to herbs and twigs of bushes like chickadees, and subsisting upon insects largely caught on the wing. Some of the species, called "dansadors" in Brazil, gather in little parties in the breeding season, and go through queer active motions, called dancing. Consult Evans, 'Birds' (1900).

MANAOAG, ma-na'wăg, Philippines, a pueblo of the province of Pangasınán, Luzon, situated on the Malabolo Rıver, 18 miles east f Lingayén, an important road centre. Pop 22,000.

MANAOS, mä-nä'oos, Brazil, city and capital of the state of Amazonas, on the Rio Negro, 12 miles above its confluence with the Amazon A whitewashed cathedral rises in the centre of the town, which also has a custom-house, a small fort and a military barracks and hospital. The city is a steamboat station, and has a considerable trade in various forest products, but principally in india-rubber. Pop. about 87,000.

MANAR, ma-nar,' or MANAAR, Gulf of, southern India, an ocean inlet between Ceylon and the Madras coast with an extreme width of 150 miles. It is almost closed at Palk Strait on the north by Adam's Bridge, a low reef of rocks and islands. The gulf has celebrated pearl fisheries

MANASAROWAR, ma-na-sa-rō-war', Tibet, a sacred lake and pilgrimage resort north of the main Himalayan range, near Darchan, between the sources of the Brahmaputra and the Indus It is almost circular in form, about 15 miles in diameter Another lake in the same locality is the source of the Indus.

MANASSAS, ma-nas'as, Va, town and Prince William County seat, alt 317 feet, on the Southern Railway, 33m, by rail, SW of Washington It is on state and federal highways, and has an airport, but not airline service. It is a trading center for an agricultural region. It has mayor-council-manager government. Manassas is near the creek called Bull Run. It was twice a battlefield in the Civil War. The courthouse has a collection of war relics. Pop. (1930) 1,215; (1940) 1,302 See Bull Run, Battle of.

MANASSAS, First and Second Battles of. See Bull Run.

MANASSAS GAP, Engagement of. General Lee, in retreating from Gettysburg, crossed the Potomac at Williamsport, into the Shenandoah Valley, and 15 July 1863 marched to Bunker Hill, and occupied the gaps of the Blue Ridge On 19 July he ordered Longstreet to march next morning to Culpeper Court House, by way of Front Royal and Chester Gap General Meade crossed the Potomac at Harper's Ferry and Berlin, on the 17th and 18th, and moved up the Loudoun Valley along the eastern side of the Blue Ridge; and on the 21st Merritt's brigade of Buford's cavalry division, pushing well up into Manassas Gap, skirmished with the 17th Virginia Infantry, and took 20 prisoners, from whom it was ascertained that Lee was moving up the valley with the evident intention of passing to the east of the Blue Ridge. Meade ordered the Third, Fifth and Second corps to march upon Manassas Gap, directing General French, commanding the Third corps, then guarding Ashby's Gap, to hasten to Buford's support Before dark of the 22d French reached Piedmont, and Birney's division was pushed forward to Buford's aid followed by the remainder of the corps, and at daylight of the 23d entered the Gap and relieved Merritt's cavalry, which moved up to Chester's Gap. Meanwhile, at dawn of the 23d Hood's division of Longstreet's corps had marched from Front Royal and, relieving the 17th Virginia, was deployed in the Gap where it was relieved during the morning by Wright's brigade of about 600 men of R H Anderson's division, under orders to hold the Gap until relieved by Ewell, then marching from Win-chester Wright's brigade was deployed at the west end of the Gap, and Rodes' division, with two batteries of artillery, coming to its support, drew up about 600 yards in rear, and sent 250 sharpshooters to take position on its left. These dispositions were completed about 2 PM Meanwhile Birney's division had advanced, steadily driving in the Confederate outposts and from Wapping Heights beyond which was Wright's line. About 4 PM Spinola's Excelsior bigade and two regiments of Ward's went forward at a charge and, sweeping past Wapping Heights, engaged Wright's men in a close and severe fight, driving them back upon Rodes, who stood firm, the artillery checking the Union advance about dark, Rodes' line not being engaged, and losing but 15 killed and wounded. Wright's loss was 19 killed, 83 wounded and 66 missing French's loss was 21 killed and 84 wounded Ewell fell back to Front Royal during the night Next morning the Union advance marched to Front Royal, but all of Lee's army had passed and, marching swiftly through Chester and Thornston's gaps it took position on the south side of the Rappahannock. Consult 'Official Records' (Vol XXVII); Humphreys, 'From Gettysburg to the Rapidan'

MANASSEH, the older but less important of the two sons of Joseph, whose name is derived from the word "to forget," and explained as signifying "he who causes one to forget," that is "all my toil" (Gen. xii, 51). Although in Jacob's blessings, he was made subordinate to his younger brother, Ephraim (Gen. xlviii, 14), he was to be protected by the redeeming angel and to become a great people (Gen xlviii, 16, 19) As the next verse reads, "in thee shall Israel bless, saying God make thee as Ephraim and Manasseh," the phrase forms the benediction which Jewish parents utter over their sons on the eves of Sabbaths and holidays The name is held by one of the tribes of Israel, to which was allotted a position in the land of Canaan. It was the sixth in numerical strength (Num. xxvi, 34). During the journey through the desert of Sinai, its station was with Ephraim and Benjamin west of the Tabernacle, and it took a prominent part in the battle and later Israel's strongest chiefs, Gideon and Jephthah, belonged to Manasseh. Its territory was situated on both sides of the Jordan. With the centuries, the tribe fell behind Ephraim in power and prominence, and like Reuben and Gad it carried assimilation so far that it lost its identity, as it practised the idolatries of the people among whom it lived

MANASSEH, king of Judah, Hezekiah's successor, boy of 12 on his father's death (2 Kings xxi, 1), and reigning 53 years. In the inscriptions of Assyria, he is mentioned as a vassal king during the reigns of Esarhaddon and Assurbanipal, who were aggressive monarchs, plundered Egypt and Phœnicia is well. Further light is thrown on the calamitous rule of Manasseh by the statement (2 Chron xxxiii, 11) that the Assyrian captains took him in chains to Babylon, as punishment for Judah's disloyalty to God On his repentance, however, he regained his throne and showed a genuine religious spirit which gave a new character to his nation. Ezekiel in a memorable chapter (viii) describes the spread of religion during Manasseh's reign and how the popular worship was a shameless blend of foreign idolatries, the influence of which was not quickly overcome, and against which the prophets declaimed at the peril of their lives. A prayer in Greek attributed to Manasseh, when captive in Babylon, is found in the Apocrypha, but never recognized as canonical by the Church. Jewish tradition makes no reference

to it Late critics claim that the prayer was originally in Hebrew

MANASSEH, son of Johanan, the high priest and brother of Jaddua, and who married Sanballat's daughter In Nehemiah (x11, 28) he is referred to without name, and he is further declared as having been deposed from the priesthood on account of being Sanballai's son-in-law In Josephus (Antiq xi, 8, 2-4), a fuller account is given Incensed at Manasseh's marriage with a foreign woman, his brother Jaddua, the high priest, placed before him the alternative of divorcing his wife or giving up the priesthood. When he went to Sanballat and frankly declared his preference for the priesthood, despite his love for his wife, his father-in-law assured him if he would retain his wife that the king would give him the rank of high priest Sanballat added that when he built with the king's approval a temple on Mount Gerizim, Manasseh should be its high priest. Hence he remained with his father-in-law, and became high priest in the Samaritan temple on Gerizim. A conflicting passage in Josephus (Antiq xm, 4, 1) mentions Manasseh as high priest at Jerusalem between the priesthood of his nephew Eleazar and that of Omas II

MANASSEH BEN ISRAEL, Hebrew scholar: b La Rochelle, 1604; d. Middleburg, Netherlands, 26 Nov 1657 His parents had resided at Lisbon but persecution rendered it prudent for them to remove to the north, and after a comparatively brief sojourn at La Rochelle, the family settled in Amsterdam, where the subject of this sketch was educated In 1620 he became rabbi of the congregation Neveh Shalom of Amsterdam, and soon became a noted preacher He started the first Hebrew press in Holland in 1627, published a prayer-book, a Hebrew grammar and an edition of the Mishnah. In 1632 appeared the first volume of his great work, 'El Concilhador,' a commentary and discussion of the discordant passages of the Old Testament This work, written in Spanish, brought Manasseh great fame among the learned of his time and he maintained a correspondence with Grotius, Bartaeus and others He sought the readmission of Jews to England but although favored by Cromwell his project did not receive the approval of Parliament. Other works from his pen are 'Hope of Israel' (1650); 'Pedro Glorioso' (1655); 'Viindiciæ Judæorum' (London 1656); 'De la fragilidad humana'; 'Thesoro dos Dinim,' etc.

MANATEE, an aduatic mammal or «seacow» of the order Surena (q.v., for general structure), several species of which inhabit the fresh waters along the eastern coasts of tropical America and of western Africa. The body is somewhat seal-like in shape, reaches a length of 8 or 10 feet, has a large round head with bristly, turnid lips, no apparent neck, no external ears, the forelimbs converted into paddles, no hind limbs, and the tail spade-shaped, like that of a beaver. The thick wrinkled skin is blackish, and almost hairless, but a coat of short, seal-like fur clothes the fœtus, indicating descent from furry ancestors. Structurally the manatee differs from other sirenians in having only six cervical vertebræ, and in the large number of molar teeth, which apparently go on increasing indefinitely during the animal's life,—the suggestion being, as Beddard points out, that

they are worn away by the attrition resulting from so much sand being mixed with the daily food The cleft lip to be mentioned hereafter is also a generic peculiarity. The manatees are stupid, gentle, defenseless and harmless creatures, showing great affection for their young, one or two in number, which are nursed at pectoral udders, often while the mother stands erect upon her tail enfolding the "calves" with her broad arms. They never come ashore, but secrete themselves amid aquatic vegetation, where the only enemies they need fear are the larger alligators and the jaguar Their food consists of fresh-water weeds and their roots, and these are procured by means of the curious form of the upper hp: "this is split in two, and the two halves, which are furnished with strong bristles, can play upon each other like the points of a pair of forceps." This cleft-lip is only suggested in the case of the dugong, but the fœtus of that animal shows the structure plainly, indicating that the manatee is the more primitive form of the two The flesh is excellent for food. The American manatees have been nearly exterminated They formerly abounded in the Indian River and other marshy waters about southern Florida, but by the end of the 19th century had been reduced to a small, carefully protected band near Biscayne Bay in the Miami River. They still survive in small numbers along the coast of the Carribean Sea and about the mouths of the Orinocco. The Florida manatee is called by American zoologists. Manatus, Interesting by American zoologists Manatus latirostris, and is regarded as different from those of Central and South America, long known as M. americanus. The African species is M. senegalensis. Consult Beddard, 'Mammals' (New York 1901).

MANATEE, Fla., town in Manatee County; adjacent to Bradenton; on Atlantic Coast Line and Seaboard railroads It has fruit and vegetable packing plants. Pop. (1940) 3,595.

MANAYUNK, măn-a-yunk'. See Phila-DELPHIA

MANBY, George William, English inventor: b. Denver, Norfolk, 28 Nov. 1765; d Southtown, Great Yarmouth, 18 Nov. 1854. He was educated at the military college of Wool-wich, and became in 1803 barrack master at Great Yarmouth. His attention having been drawn to calamities resulting in cases of shipwreck, from the difficulty of establishing communication with the shore, he attempted casting a rope from the shore to the wreck by the agency of gunpowder. Chains were unable to stand the shock of the discharge, but stout strips of rawhide closely platted together were found to answer, and on 12 Feb 1808 the entire crew of the brig Ehzabeth, wrecked within 150 yards of the beach, were rescued by the simple contrivance of Captain Manby. In 1810 has invention was brought before a committee of the House of Commons, and having been favorably reported on, he received a grant of money, and all the dangerous stations on the British coasts were supplied with his apparatus. He also contrived shells filled with luminous matter, to enable the crew to perceive the approach of the rope, in the manufacture of which he suggested several improvements.

MANCHESTER, Conn, town in Hartford County; alt. 140 feet; on the New York, New Haven and Hartford Railroad; 8m. E. of Hartford The township (which includes South Man-chester) is situated in a feitile area growing fruits, vegetables, tobacco and nuisery products. The Cheney silk mills, established here in 1838, form the town's chief industry. Other manufactures include woolens (made here before 1790), soap, paper and fiber board, parachutes. electrical instruments, needles, clothing, base-balls, toys, leather novelties, machinery and tools, and chimes Manchester has the Whiton Memorial Library, and South Manchester, the Mary Cheney Library. There is a state trade school here Settled in 1672, it was a part of Hartford, and then of East Hartford, until its incorporation in 1823 Town government is operated under a special legislative charter. Pop. (1940)

MANCHESTER, England, an episcopal and university city, inland port and Parliamentary and county borough of Lancashire, 188 miles north of London and 31 miles east of Liverpool, on the Irwell, an affluent of the Mersey, since 1894 connected with the sea at Eastham, on the Mersey, by the Manchester Ship Canal, 35½ miles long. It is one of the principal manufacturing cities of the world and the cotton trade centre of Great Britain. It covers over 21,645 acres Railways and electric street tramways communicate with the surrounding towns and villages of the most populous industrial region of England.

Geology.— Manchester is built on a large plain, within easy distance of breezy hills and moorland, which are clearly visible from the outskints of the city. The surface of the outskirts of the city. The surface of the ground is composed of thick deposits of glacial drift - boulder clay, sands and gravels - beneath which are Triassic, Permian and Carboniferous rocks. Ruch coal-fields are found in the neighboring parts, some of which extend

under a portion of the city.

Industries and Finances.—Though Manchester as the chief seat of the cotton trade, it is no longer that of its manufacture, much of that industry being carried on in towns and villages beyond its borders. A considerable number, however, remain of cotton mills, print works, dyeing and bleaching concerns and factonies concerned with other branches of textile manufacture. Engineering and machinery works are exceedingly numerous, as are the manufactories of electrical appliances. It is calculated that there are about 700 different industries carried on here, some of the chief among them, apart from those named above, being chemical, india rubber, paper and glass works. The membership of the Royal Exchange is over 7,000 and the Grocery Exchange about 3,000. There are also stock, corn, provision, coal and cotton-waste exchanges. vegetable and fruit market serves for the whole of South Lancashire and part or Chesine, while the fish market is second only to Billingsgate. There are nearly a score of banks, with numerous branches The business of the post office exceeds that of any other out of London.

Bridges and Railway Terminals.—The bridges are of no engineering importance, as the Irwell is here but a narrow river. The South Lancashire and part of Cheshire,

the Irwell is here but a narrow river. The terminal railway stations are four in number. (1) London Road, 1842, rebuilt 1881; (2) Victoria, 1844, serving London, Midland and ScottonLish Railway; (3) Central, built 1877, near which the Midland Railway Company have erected a great hotel; (4) Exchange, 1884 contiguous to the Victoria station and serving the L M S. and G W. The oldest railway station in the world is still to be seen in Liverpool Road, though not used for its original purpose. It was opened in 1830

Buildings.— The principal public building is the town-hall, commenced in 1868 and completed in 1877, at a cost, including land, of upwards of a million pounds. It covers an area of 8,648 square yards. The clock-tower is 286 feet high and contains a peal of 21 bells. In the great hall is a series of frescoes by Ford Madox Brown, illustrating incidents in the history of Manchester. The old town-hall, erected in 1825, is now occupied as a Free Reference Library. It is a classical building, and another of the same style and period is the City Art of the same style and period is the City Art Gallery, formerly known as the Royal Institution The Royal Infirmary, which originated in 1752, is situated in one of the finest positions in the centre of the community, but has been removed to an exclusive new building on a site on the outskints. The Free Trade Hall (1856), built in the Italian style, will hold 5,000 people and has been the scene of many great political meetings and of the renowned concerts conducted by Sir Charles Hallé and Dr. Hans Richter. In a similar style is the Royal Hans Richter. In a similar style is the Royal Exchange (1868-74), one of the most spacious erections of its kind. The area of the great hall is 5,170 square yards. The Assize Courts by Alfred Waterhouse, the architect of the town-hall, were built in 1864, at a cost of £100,on Immediately to their rear is the county jail. The university buildings are also by Waterhouse. The John Rylands Library, by Basil Champneys, is perhaps the chief architectural gem of the city. Other examples of street architecture worthy of attention are the City Police Courts, the Corn Exchange, the Inland Revenue Offices, the Post Office, the Fire Brigade Station, Reform and Conservative clubs, and many of the banks, insurance offices and warehouses. The Municipal School of Technology is one of the most striking examples anywhere of a well-equipped school in an imposing building.

Educational Institutions.—Manchester University (qv) was reconstructed as an independent corporation in 1903. It was originally founded as the Victoria University in 1880, with a federation of the Owens College, Manchester, and the University College, Liverpool, as its colleges, to which the Yorkshire College at Leeds was afterward added; but in 1903 a separate university charter was granted to each city. The Owens College, which has now been incorporated with the university, was founded in 1850 by the aid of nearly £100,000 left by Mr John Owens. It began work in a large house formerly occupied by Richard Cobden and was removed to the present fine buildings in 1873. Since then the Museum, Christie Library, medical school, physiological and other laboratories and the Whitworth Hall have been added and the institution has benefited from many large gifts and bequests. The splendid Mumicipal School of Technology is affiliated to the university, and the subjects in the faculty of technology are taken there. The faculty of theology was instituted in 1904, and the co-

operation of the various theological colleges was obtained. These include Baptist, Free Methodist, Independent, Primitive Methodist, Roman Catholic, Unitarian and Wesleyan colleges. The oldest educational institution in the city is the Grammar School, founded by Bishop Hugh Oldham in 1515. It has now 1,070 scholars. Many distinguished names appear in the records of its alumni. Chetham's Hospital is named below. The following may be added: The Girls' High School, the Hulme Grammar School (founded by the Hulmean trustees), the Nicholls Hospital, Warehousemen and Clerks' School and the Royal Manchester College of Music, founded in 1893, as well as the numerous elementary and other schools.

ous elementary and other schools.

Libraries.— Of libraries, the most recent, the John Rylands Library, is the most widely known, on account of its marvelous collection of rare and costly books and manuscripts. Its 250,000 volumes embrace the Althorp Library, purchased from Earl Spencer, and Lord Crawford's collection of manuscripts. It was founded and endowed by Mrs Rylands in memory of her husband and was opened in 1899. The Chetham Library dates from 1656, from which time it has been open free to all, and is part of the foundation of Humphrey Chetham, the other part being a hospital or school for poor children. The Public Free libraries were established in 1852 and are supported by a public rate, which now yields over £35,000 a year. The chief or reference library contains over 200,000 volumes and the 24 branch or lending libraries some 300,000 volumes. The Christue Labrary at the university was built by the late Mr. R. C. Christue, and on its shelves are the entire libraries of Mr Christie, of Bishop Prince Lee, Prof. E. A. Freeman, in addition to other precise and content of the Medical special and general collections. The Medical and Law libraries belong to the members of

those professions, and there are other public and semi-public libraries of importance.

Art Galleries.—The City Art Gallery has been maintained by the corporation since 1882 and contains many fine examples of the British school, particularly works of Millais, Leighton, Holman Hunt, G. F. Watts and other modern artists. In this gallery, which formerly belonged to the Royal Institution, annual exhibitions have been held since 1827. The Manchester Academy of Fine Arts also holds its exhibitions here. Attached to the Municipal School of Art is a well-arranged art museum, and in the Whitworth Institute galleries in Whitworth Park will be found a rich collection of pictures, including a nearly complete series of specimens of the best English water colors, from those of Sandby, Girtin and Turner onward The institute is one of many benefactions enjoyed by Manchester from money

ner onward I'me institute is one of many benefactions enjoyed by Manchester from money left by Sir Joseph Whitworth.

Churches.— When the diocese of Manchester was founded in 1847 the Collegiate Church became the cathedral. It is of unknown origin, but the present perpendicular Gothic building was raised, on an earlier foundation, about 1422. A large part has been rebuilt, mainly on the old lines, in recent years, yet many interesting portions of the earlier building remain The ancient stalls in their choir have exquisitely carved canopies. The ancient parish consisted of 29 townships, including Salford, and some of them had chapels

of their own. In 1850 the ancient parish was divided into independent parishes by Act of Parliament. Next to the cathedral the oldest church is Saint Ann's (1712), which contains some beautiful windows by F. G. Shields. Many of the 19th century churches are of considerable pretensions. Besides 91 belonging to the Church of England there are 28 Roman Catholic churches and many others belonging to various sects. The Jews have 11 synagogues, and there is a Greek and an Armenian church.

Hospitals.—Hospitals to the number of over 20, all maintained by voluntary subscription, are provided for the treatment of nearly every complaint to which the human frame is liable. The Royal Infirmary is the chief one. Saint Mary's Hospital and the Eve Hospital are others of large dimensions, while to the Hospital for Consumption is attached a sanatorium at Delamere in Cheshire, which was provided at a cost of £70,000 by a local benefactor (W J. Crossley). In addition there are several dispensaries and asylums, and a large number of

charitable institutions of various kinds

Societies.—The literary and scientific societies are many in number and of high standing. The Chetham Society and the Record Society devote themselves to the publication of historical records of Lancashire and Cheshire. The Antiquarian Society (1883) has similar objects. The Literary and Philosophical Society was founded in 1781, the Literary Club in 1862, the Statistical Society in 1833, the Geological Society in 1839, the Geographical Society in 1884. These, as well as the Microscopical, and some other societies, all publish their transactions. Musical societies are numerous and vigorous, and the artists, architects, lawyers, doctors, accountants and men of other callings have their own societies.

Public Works, Parks, Etc.—The corporation is the owner of the waterworks that supply Manchester and Salford and some surrounding towns and villages. The water comes from Longdendale on the borders of Derbyshire and Thirlmere in Cumberland, and the works have cost over £8,000,000. The average quantity of water supplied per day is 38,000,000 gallons. The gas works have been the property of the corporation since the incorporation of the borough, and have always yielded a profit in aid of the rates. The supply of electricity is also a municipal undertaking. So also the fire brigade, public abattoris, the foreign animal wharf on the Ship Canal, cold-air stores and the extensive sanitary works. The markets and the electric tramways are under municipal ownership. The city has many public parks, open spaces and playgrounds. The area of the largest (Heaton Park) is 662 acres and its cost was £220,000. The other municipal works infectious diseases hospitals, libraries, art galleries, technical school and school of arts. The council is also the local education authority for the city. The construction of the Ship Canal involved an outlay of over £17,000,000, one-third of which was lent by the corporation, who appoint 11 out of the 21 directors of the Ship Canal Company.

Government.—Since 1838 Manchester has been governed under the Municipal Corporations Acts and a long series of local statutes. The council consists of 144 members, 35 of

whom are aldermen. The head of the council is styled lord mayor, that title being confered in 1893. The administration of the Poor Law is entrusted to thice boards of guardians, for the Central and the North and South townships, and there are separate workhouses and other necessary establishments. There is a court of record for the trial of civil actions, established in 1838 and reconstituted in 1858, and now amalgamated with the court of record of the hundred of Salford, and since 1839 there has been a separate commission of the peace and separate quarter sessions. The Assize, County, Chancery and other law courts held in the city.

are not under local control

History. Manchester was in prehistoric times occupied by the Britons, as proved by urns and implements that have been unearthed, and abundant Roman relics bear evidence to a long period of Roman occupation Little is known of the tule of the English or Saxons. but among other traditions is that of Queen Ethelbega, wife of Ina, king of Wessex, having lived here in 689, and of the Danes sacking the town in 863. In 923 King Edward the Elder son of Alfred the Great, rebuilt and fortified Manchester Manchester is mentioned in the Domesday Book, 1086, as possessing two churches, one of which is now conjectured to have been at Ashton-under-Lyne, originally in the parish The barony of Manchester was held by the Gresleys, 1086 to 1313, and the last of that family granted a charter to his burgesses in 1301, and at was by this charter that the town was governed for over five centuries. The manor was afterward held by the De la Warres and the Wests until 1579, when it was sold to John Lacye, a London mercer, for £3,000, who an turn disposed of at an 1596 for a profit of £500 to Sir Nicholas Mosley, a Manchester man, who had become a prosperous London merchant, destined to fill the office of lord mayor three years after his purchase of the manor. In his family the manor remained until 1845, when the whole of the manorial rights were purchased by the corporation for £200,000. One of the lords of Manchester, Thomas la Warre, entered the priesthood, became rector of the parish and in 1421 provided the means for collegiating the church, and gave his manor-house as a residence for the clergy of the college. This house, now known as Chetham's Hospital, is, apart from the church, almost the sole architectural relic of feudal Manchester. After the Reformation the building was confiscated by the Crown, and in the reign of Edward VI passed by purchase to the Earl of Derby. In his family it remained until the Commonwealth, when it was sequestered by the Parliament, with other possessions of the royalist Earl of Derby. In 1656 it was purchased by the executors of Humphrey Chetham and turned to its present uses. Manchester was visited in 1495 by Henry VII. It is unknown when the town began to be established as a trading and manufacturing established as a trading and manufacturing centre, but it is clear from the Act of 1541 that a considerable commercial position had by that time been attained Manchester holds an important position in the earlier history of the civil wars. At the outset the townsmen took the side of the Parliament, and made an effort to avert the conflict by presenting a petition to King Charles. The town was besieged by Lord Strange, who was repulsed. Prior to the actual

siege he demanded the delivery of the magazine, and in an affray which ensued a man was killed. This was on 15 July 1642, and the fatality was one of the first that occurred in the wars. The town was represented in Cromwell's first and second parliaments. In 1715 there were many Jacobites among the influential townsmen, and in the rising of 1745 the Young Pretender found numerous adherents here. Some of them, on the failure of the rebellion, were executed for their treason. The Duke of Bridgewater opened his canal from Worsley to Manchester in 1761, and the extension to Run-corn was completed in 1795. Distress, caused by the wars and high taxation, was a main cause of the political discontents which marked the first two decades of the 19th century, and are remembered by a weavers' riot in 1808, the "blanketeers" meetings in 1817 and the disastrous Peterloo affair of 1819, when, at a meeting to petition Parliament for the redress of grievances, several people were killed and many more injured during a charge of the military, after the reading of the Riot Act The Manchester and Liverpool Railway was opened in 1830, marking a new era in internal communication Manchester was enfranchised by the Reform Act of 1832, getting two members. (Under the redistribution of 1917, members are allocated to the city). The Anti-Corn Law League was established in 1839, and prosecuted a vigorous campaign throughout the country, culminating in the repeal of the Corn Laws in 1846. In 1847 the bishopric of Manchester was created and the collegiate church converted into a cathedral Queen Victoria paid three visits to Manchester, the first in 1851, the second in 1857 and the last in 1894, when she opened the Ship Canal The great Art Treasures Exhibition was held in 1857 and the Jubilee Exhibition in 1887. Both in 1887 Both were remarkably successful, the latter yielding a profit of £43,300, which was devoted to public uses. From 1862 to 1865 there was great distress throughout the cotton manufacturing districts, owing to the American War; a relief fund of over \$1,000,000 of money was raised on behalf of the operatives. The Ship Canal was projected in 1882 and opened in 1894 In March 1902 the city was visited by the Prince and Princess of Wales. In July 1905 King Edward VII opened a new dock at the Ship Canal. The city suffered severely

from German bombing raids in 1940-41.

Population.—The population of Manchester is about 756,000. In 1841 it was 242,983; in 1871, 351,189; in 1891, 505,368; in 1931, 766,378. The great increase is partially accounted for by the extensions of the city boundaries which have taken place since 1885.

have taken place since 1885.

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CHARLES W. SUTTON, Chief Librarian, Manchester Public Free Libraries.

MANCHESTER, Iowa, city and Delaware County seat, alt. 919 feet, on the Maquoketa River and on the Illinois Central and the Manchester and Oneida railroads (the latter electric), 130m NE. of Des Moines, also on state and federal highways. Situated in an agricultural region, the city is a dairying center and a trading point for the farmers of the county. There is a public library here. Settled in 1850, as the town developed it was first known as Burrington; the present name was adopted in 1856 Incorporation as a city was effected in 1886 Manchester has a mayor and council, and a city manager. Pop (1930) 3,413; (1940) 3,762.

MANCHESTER, Mass, town in Essex County, alt. 14 feet; on Massachusetts Bay; 6m. SW. of Gloucester, on the Boston and Maine Railroad. Originally a fishing village, it began to develop into a summer resort about 1850 Settled about 1626, the place was known as Jeffrey's Creek until 1645, when the name was changed and the town was incorporated. There is a library, and the historical society has curatters in an old home. A brick building has quarters in an old home. A brick building in which ammunition was stored during the War of 1812 stands on Powder House Hill, Pop (1930) 2,636, (1940) 2,472. Consult Lamson, «History of the Town of Manchester.»

MANCHESTER, N. H., the principal city of the State, one of the county-seats of Hillsboro County, on the Merrimac River at the mouth of the Piscataquog, 18 miles south by east of Concord, and on the Boston and Maine Railroad. The first settlement was made in 1722 and for a number of years it was called Amoskeag and Tyngstown. In 1751 it was in-corporated as Derryfield and in 1810 the name was changed to Manchester. It was chartered as a city in 1846. The Amoskeag Falls (55 feet) in the Merrimac, above the city, provides extensive water-power which, by means of canals, is made available for manufacturing. goods manufactures and woolen goods manufactures are the city's largest industries and for many years the mills of the Amoskeag Manufacturing Company were considered the largest cotton manufacturing plant in the world. Competitive conditions made the enterprise un-profitable after the depression of 1929 and the plant was closed. Local business men, determined to save for the city this valuable industry, bought the plant and leased parts of it to scores of small manufacturing enterprises which have since operated successfully. The Amoskeag plant at the height of its prosperity operated over 660,000 spindles and 24,000 looms and consumed 55,000,000 pounds of cotton yearly. The mills have been operated for more than a century, having been founded in 1810. There are numerous other important industries in the city, especially the shoe industry. The city covers an area of about 35 sq. mi., is well laid out and its residential districts present an attractive appearance. It is the seat of a Roman Catholic bishop since

1884 Near by are two notable Catholic schools, Mount Saint Mary, at Hooksett; and Saint Anselm's College, at Goffstown The Carpenter Memorial Library is one of the finest structures of its kind in New England, and other outstanding buildings are those of the Currier Gallery of Art; the Institute of Arts and Sciences, the Association Canado-Américaine; and the Manchester Historic Association City Hall, built from red brick of local manufacture, dates from 1845 Manchester was the home of Gen John Stark (q v), hero of the French and Indian, and the Revolutionary wars Stark Park, in which the general is buried, is one of the most beautiful in the vicinity, overlocking the Margareae Privalence. in the vicinity, overlooking the Merrimac River and the Uncanoonuc Mountains, the Stark home is owned by the Daughters of the Revolution, and the site of the old Stark family homestead forms a part of the grounds of the State Industrial Home Other points of interest are Rock Rimmon, with its story of an Indian maiden's love tragedy; Mast Road, on the Piscataquog River, named because of the giant pines reserved for the British navy having been transported over it; Goffs Falls, near which was the homestead of the Goffe family, first white settlers in the district, and the Blodgett Canal, completed in 1807, once important as the last link of an inland waterway from Boston to Concord Manchester has many fine summer homes, a considerable summer resort business, and a municipal airport. Pop (1940) 77,685.

MANCHESTER, Va, former city in Chesterfield County, on the James River, opposite Richmond, to which it was annexed in 1910.

MANCHESTER, Vt, town and one of the two Bennington County seats, alt 694 feet, on the Rutland Railroad, 32 miles southwest of Rutland. It is also on state and federal highways, and is in a farming section. There are marble quarries near by. It makes fishing rods and flies, and clothespins. The town government body is a board of selectmen. The Mark Skinner Library is a memorial to one of the early families Manchester played a prominent part in the formative period of the state's history, when New York and New Hampshire struggled for control. The New Hampshire Grants, after the French and Indian wars, included the grant of Manchester township in 1761 Manchester was a center of Vermont activities in the Revolutionary War. It was a junction point of stage coach traffic. Manchester is the seat of Burr and Burton Seminary, founded in 1829. A Southern Vermont artists' exhibition is held annually in the Seminary gymnasium. The town has a number of old colonial buildings, and fine modern summer homes. The sidewalks are made of marble slabs On the green is a soldiers' monument, with a statue of a Continental soldier. The place was named after Manchester, England. Pop. (1940) 2,139.

MANCHESTER CANAL, England, a great ship canal, by which Manchester (q.v.), an inland town, was virtually converted into a seaport. See Ship Canals.

MANCHESTER UNIVERSITY, England, known officially as Victoria University of Manchester. In 1846 a Manchester merchant, John Owens, left £96,000 for the foundation of a college for boys of 14 years and older, from Manchester and vicinity. Owens College opened

on March 12, 1851, with five professors, and in the fall term there was an enrollment of & students. (Women students were first admitted in 1883) A charter was granted in 1880 for the federal Victoria University, with constituent colleges at Manchester, Leeds, and Liverpool The arrangement was short lived; by 1904 they were separate, and Owens College was incorporated into Victoria University of Manchester. The constitution of 1903 provided for a chancellor, vice-chancellor, court of governors, council, and boards of faculty and students. There are nine faculties: arts, science, law, medicine, music, economic and social studies, theology, technology, and education. Manchester Museum is affiliated with the university and was established for the promotion of natural science. In 1945–1946 there was a faculty of 350, with 3,444 students, and a library of 323,844 volumes.

MANCHURIA, a region comprising the extreme northeastern portion of China, known to the Chinese as Tungpei, meaning the Northeast; called Manchuruo during the Japanese domination. The territory lies mainly between latitudes 40° and 53° N. and longitudes 118° and 135° E. It is separated from Asiatic USSR on the north and northeast by the Amur River, on the east by the Ussuri, and on the northwest by the Argun. On the west it is bounded by the Mongolian People's Republic and China Proper; on the south by Korea and the Yellow Sea. The estimated area is 431,558 square miles. The estimated population (1945–1946) was 37.783,252 Its leading cities are Changchun (Hsinking; 1936 pop 246,664), Mukden (Shenyang; 1947 pop. 530,173); Harbin (Pinkiang; pop 278,083); and Dairen (Talien; pop. 184,954) Before the Japanese seized Manchuria in 1931, it was divided into three provinces—Liaoning (Fengtien), Kirin, and Heilungkiang After Chinese recovery of the northeast in 1945, it was divided into nine provinces. Liaoning, Antung, Liaopei, Kirin, Sungkiang, Hokiang, Heilungkiang, Nunkiang, and Hsingan (qq.v.). The former Kwantung Leased Territory, including Dairen and Port Arthur, lies on the tip of the Liaotung Peninsula which is in Liaoning Province

The Land.—Vast chains of mountains ramify over the northeast, with the Khingan Mountains in the north and the Changpai Range in the south. The principal rivers are: the Amur; the Argun; the Sungari, the vast basin of which occupies the rich central part of the territory; the Ussuri, a tributary of the Amur; the Yalu and the Tumen, which separate Manchuria from Korea; and the Liao, which flows through the rich southern Manchurian delta into the Gulf of Liaotung. The climate is in most parts healthful and invigorating. In the north and more elevated parts, the cold of winter is intense, the thermometer sometimes falling to 48° below zero, and the snow lying for six months in the year. The summer temperature reaches about 90° in the shade.

The People.—South Manchuria was historically populated by Chinese. North and east Manchuria were occupied by tribes known historically as Suchen, Khitan, Juchen and Tungus West Manchuria was partly occupied by Mongols. The Juchens were also known as Manchu who established the Manchu dynasty from 1644-1911. Present day Manchuria, however, is mainly Chi-

nese. The great majority of Manchus have adopted Chinese names, customs and language The Manchurian language, which became a dead language even before the end of the Manchu dynasty in 1911, was created in the 17th century patterned after the Mongolian language. The language is written from top to bottom and

from left to right.

Natural Resources and Production.-The soil in the northeast is exceedingly fertile, especially in the valleys of the Liao and Sungari rivers. It is China's breadbasket; soybean, wheat, millet, sugar beets, rice, peanuts, and many other crops grow in abundance It also produces cotton, tobacco, and a great deal of wool, while its silk industry is promising. The vast forests of the country are rich in useful timber of all kinds, such as walnut and oak, together with the soft pine and fir. They abound in wild animals: the tiger, panther, bear, fox, wolf, and stag, as well as the eagle and other birds of prey The rivers abound with fish But what makes the region particularly valuable to China is its underground wealth. Manchuria has 80 per cent of China's iron deposits, and some of her best coal deposits, including one of the largest open-pit coal mines in the world. No large-scale oil reserves have been found in the northeast, but its rich deposits of oil-bearing shale supply crude oil while its rich coal reserves offer a bright future for the gasoline-extracting industry. As for other minerals, the aluminum and magnesium reserves are very large There are also important reserves of tungsten, tin, gold, silver, zinc, copper, asbestos, molybdenum, limestone, marble, and other minerals. The territory has a huge salt production to substantiate a vast chemical industry.

There is a good network of railways in Manchuria, with a total mileage (1947) of 8,000 miles. With its fine harbors, the area is capable

of a high degree of industrialization

Finance.—In the years under Japanese domination, Manchuria belonged to the Japanese yen block and a paper currency known as the Manchukuo yen was in circulation. After the Soviet declaration of war on Japan on Aug 9, 1945, the Soviet troops occupying Manchuria issued in undetermined amount a special Soviet military note for circulation in Manchuria. These notes were later redeemed by the Chinese government. The present (1947) currency in circulation is known as the northeast currency note, each dollar of which is equivalent to 12.50 Chinese National currency dollars. Because of its past high production and sounder financial foundation, inflation in Manchuria is not so severe as it is in China Proper. Consequently its currency is in a more advantageous position than the Chinese National currency.

Government.—After the Chinese recovery of Manchuria, it was divided into nine provinces and nine provincial governments were established to handle all civil administration in the territory under the direction of the President's Headquarters in the northeast established in Changchun. A Northeast Economic Council was established to direct and coordinate all economic activities in the area. A Northeast Peace Preservation Headquarters was established to direct all military activities. The provincial governments have different departments in charge of civil administration, finance, education, reconstruction, and other duties. Under the provincial governments are county governments administering

county affairs. Provincial political assemblies serve as provincial representative bodies in their respective provinces. Many of the provincial governments however, are unable to function as their territories are under Communist control. The Communists have their own administrative

organs in their areas.

Way of Living.—As Manchuria is now predominantly Chinese, the way of living of people there is not different from north China Chinese. Both men and women dress in long gowns. In winter, most women dress in long trousers to protect them from the severe weather. Their staple food is wheat flour and kaoliang Their religions, like that of north China Chinese, include Buddhism, Confucianism, Islam, Taoism, and Christianity There is complete freedom of religion in Manchuria as in other parts of China.

Education.—The education system in the northeast is the same as other parts of China. Theoretically, children are required to go to school when six years of age They have six years of primary school education. The middle schools are divided into junior and senior middle schools each of three years. The colleges and universities are four-year institutions. There are also normal schools and professional schools for students who want to go into training for teaching or other professions after finishing primary schools. Because of the inadequate number of schools, there is a high rate of illiteracy in Manchuria especially among the adults.

Manchuria, especially among the adults.

History.—Manchuria came within the horizon of the Chinese Empire in the 3d century B.C. and the Liao River valley was already then populated by Chinese settlers. Manchuria began to play an important part in Chinese history when the Khitans founded the Liao dynasty in the 10th to 12th centuries and when the Juchens founded the Gold dynasty in the 12th and 13th centuries. Both dynasties, however, limited themselves to Manchuria and north China It was when the Juchens founded their Ching (Manchu) dynasty in the 17th century that they conquered other parts of China. The founder of the Manchu dynasty was Nurhachi who began his career of empire building in the area around the middle Sungari, near present Changchun. He rose from very small beginnings but was soon able to conquer other clans and tribes, and create a big warlike state outside of the Great Wall, laying the ground for further invasion of China Proper by his successors in early 17th century. Finally, his successors were able to overrun entire China and established the Manchu dynasty in 1644. Thereafter they made Manchuria a crown reserve territory and Chinasa churia a crown reserve territory and Chinese immigration, which had been in progress for centuries, was forbidden. But in practice, Chinese immigrants were able to move into Manchuria in increasing numbers during the Manchu dynasty which eventually allowed this movement in the later 18th century

For a considerable time prior to 1891, when the first sod was turned for the construction of the Trans-Siberian Railway, the Russian government was anxious to secure control of Manchuria. Japan, meanwhile, was casting covetous eyes upon the mainland of Asia, and especially upon the northeast. When China was defeated in the first Sino-Japanese War in 1894–1895, Japan secured from China through the Treaty of Shimonoseki (April 17, 1895), among other things, the cession of Formosa (Taiwan), Pesca-

dores Islands, and the Liaotung Peninsula on which tip lie Dairen and Port Arthur in southern Manchuria. Six days after the signing of the treaty, the Japanese government received notes from the governments of Russia, Germany, and France "recommending" that Japan restore to China this peninsula. Japan, weak though victorious, accepted this "recommendation" and surformentation and surformentation of the surface of rendered her claim to the peninsula in return for an increased indemnity from China.

Immediately after this, Russia began to push her way into Manchuria In 1896, a Russian financial interest secured the privilege of building the Chinese Eastern Railway, which is a spur of the Trans-Siberian Railway and a shortcut to Vladivostok. Another line extended from Harbin to Port Arthur (Ryojun). In 1898, Russia demanded and obtained a lease of the Liaotung Peninsula from China for 25 years, and the right to develop Port Arthur as a naval base.

The Russians occupied the northeast during

the Boxer Rebellion of 1900, although no actual fighting took place in that area After the conclusion of the treaty of 1901, the Russians re-fused to withdraw their troops from the northeast until they secured further concessions from China which gave them a "railway zone" along the railways and other special economic interests in the region. In the next few years, through arrangements with other powers and secret treaties concluded with China, Russia established her sphere of influence in the northeast

The Russo-Japanese War in 1904-1905, which was fought on Chinese territory and without any respect for China's territory rights as a neutral, saw Russia's defeat. The resulting Treaty of Portsmouth (Sept. 5, 1905) gave Japan, among other things, the "right of succession" to the Changchun-Port Arthur section, later known as the South Manchurian Railway, of the Chinese Eastern Railway, and the lease of the Liaotung Peninsula. The treaty also provided that the warring parties agreed to withdraw their troops from Manchuria with the exception of the Liaotung Peninsula, but reserved to themselves the right to maintain railway guards along their respective railway lines. (See PORTSMOUTH, TREATY OF.) The provisions of the Treaty of Portsmouth concerning China were substantiated by the Sino-Japanese treaty of Dec 22, 1905.

In a series of secret treaties between Japan and Russia, the two countries divided Manchuria into two spheres of influence, under Russia in the north and Japan in the south. The Twenty-one Demands made by Japan in 1915 further consolidated her position and economic, political, and solidated her position and economic, political, and military privileges in Manchuria. Her special position in Manchuria was recognized by the United States in the Lansing-Ishii agreement in 1917. The Nine-Power Treaty of 1922 upheld the Open Door policy toward China but left Japan in possession of her previous gains in Manchuria. To Japan, Manchuria was in actuality her protectorate. Her support of the late Marshal Chang Tso-lin in defiance of the Chinese government and her "warning" to Chang Hsueh-liang against his full adherence to the Hsueh-liang against his full adherence to the Chinese National government in 1928 clearly indicated Japan's stand. Chang, however, ignored the Japanese warning and announced his allegiance to the National government on Dec. 31, 1928. After years of quasi independence, the northeast again became, de facto as well as de integral cost of the Chinese Republic jure, an integral part of the Chinese Republic.

In 1924, the Soviet government renounced all rights and privileges which the czarist regime had acquired by unequal treaties in Man-

churia and other parts of China.

Under the overall supervision of the Na. tional government, Chang Hsueh-liang further intensified the reconstruction program launched by his father, Chang Tso-lin, to break the Japanese hold on Manchuria. This prompted the Japanese to take direct action. On Sept 18, 1931, Japan engineered the so-called Mukden Incident and within a few days occupied all of Manchuria. The puppet state of Manchukuo was established under Japanese direction on March 9, 1932, with Pu-yi (Hsuan T'ung) as the chief executive. He was later proclaimed the emperor of Manchukuo on March 1, 1934.

China appealed to the League of Nations for the peaceful settlement of the Mukden Incident. The League, after prolonged deliberations, sent a commission of inquiry to the northeast under the earl of Lytton. The commission's report, known as the Lytton report (published Oct 2, 1932), said that "the military operations of the Japanese during this night (September 18) cannot be regarded as measures of legitimate selfdefense." And in regard to the establishment of the puppet state in the northeast, the report said the two factors without which the new state could not have been formed "were the presence of Japanese troops and the activities of Japanese officials, both civil and military.... For this reason the present regime cannot be considered to have been called into existence by a genuine and spontaneous independence movement."

Meanwhile, Chinese guerillas resisted with what they had against Japan's attempt to impose Japanese rule over Manchuria.

The first few years of the Manchukuo state saw large-scale "pacification" campaigns launched by the Japanese Army to suppress Chinese resistance. Beginning from 1936, Japan launched a five-year plan in Manchuria to make the territory the arsenal and granary of the Japanese Empire through the exploitation of the rich resources and cheap labor in the northeast. From the beginning, the Manchukuo economy was a planned economy. The Manchukuo five-year plan, revised in 1938, laid special emphasis on strategic industries and supplemented the Japanese four-year plan. Most of the Manchukuo products were raw material or half-finished products to supply Japanese factories Japan also dominated all economic life of the northeast. Early in 1934, by the Oil Monopoly law, all foreign companies, including Standard Vacuum Oil and Texas Oil of the United States, were forced out of business. By the Emergency Foreign Trade Control law of 1936, the Foreign Trade Control law of 1937, and other trade measures, the importation and exportation of practically all commodities became a matter of exclusive provides of the second trade. exclusive privilege of Japanese interests. Japanese-owned companies controlled all the industrial enterprises. The South Manchurian Railway Company monopolized the railways, highways, harbors, bus and steamship services, docks and warehouses, and coal and oil at Fushun. The Manchurian Industrial Development Company controlled the coal, iron and steel, light metals, automobile and airplane industries. The Agricultural Produce Corporation controlled all crops from planting to consumption in Manchuria.

To complete the Japanese control over Manchuria, the USSR sold her share in the Chinese Eastern Railway in Manchuria to Manchukuo

The recovery of the northeast was one of China's war aims. The Cairo declaration in 1943 stated, among other things, the return of Manchuria to China after the war (See Pacts and Conferences) The letter and spirit of this declaration, however, was violated by one of the Yalta secret agreements in which, without China's knowledge and consent, the United States and Great Britain agreed that the USSR, in return for going to war against Japan, would receive a number of rights in Manchuria. The United States was to use her influence to make the Chinese accept the Yalta fait accompli. Accordingly, the Chinese government signed, on Aug 14, 1945 in Moscow, with the Soviet government a treaty which provides, among other things, the independence of Outer Mongolia; the joint ownership, for 30 years, of the Chinese Changchun Railway which comprises the former Chinese Eastern Railway and the South Manchurian Railway; the establishment of Port Arthur as a joint Chinese-Soviet naval base under Soviet garrison; and the establishment of Dairen as a free port with a Soviet port master but a Chinese mayor.

The USSR declared war against Japan on Aug 8 (effective Aug. 9), 1945, six days before Japanese surrender. Soviet troops occupied the entire Manchuria. After repeated negotiations, they evacuated the northeast, with the exception of Port Arthur and Dairen, in April 1946, but not until they had stripped the northeast of its industrial and communcation equipment and materials Meanwhile, the Soviet evacuation co-incided with the arrival in Manchuria of Chinese Communist troops who were also able to find exactly where the Japanese arms, which were surrendered to the Soviet troops, were stocked Chinese Communist troops took Changchun,

capital of the northeast, on April 17 and Harbin on April 25, 1946 They also took over northern, eastern, and southern Manchuria following the evacuating Soviet troops. Government troops recaptured Changchun on May 23. In cities evacuated by the Chinese Communists, whatever industrial equipment had been left by the Soviet troops was destroyed by the Communists Fighting continued in the northeast between nationalist and Communist troops into 1947

Since the Chinese recovery of the northeast, the territory has been under the administration of provincial governments which are under the overall supervision of the President's Headquarters in the northeast. A Northeast Economic Council directs all economic activities in the territory. The Chinese Communists have their own system of administration in areas under

their occupation.

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SAMUEL M. CHAO. Chinese News Service.

MANCHUS, a Tatar people of Tungusic origin, descendants of the Jurchin or Niu-chi, who overran northern China in the 12th century and established the Kin or Golden dynasty, later overturned by the Mongols, and of the tribes who followed Nurhachu (1559-1626) and his successors in his conquest of Liao-Tung and Liao-si, in the first half of the 17th century, who aided the Chinese general, Wu-san-kwei, in suppressing the rebel Li-tse-Ching, and who retained the country for themselves, establishing in 1643 the Ta-Tsing, or "Great Pure" dynasty which ruled China down to the establishment of the republic in 1912. They form a very small minority of the population of China to-day; they are a quiet, inoffensive people noted for their politeness. They now speak the Chinese language, their own tongue being wellnigh extinct. Physically they are rather tall, with mesocephalic head. The famed Chinese queue, but recently abolished, was introduced by the Manchus and was at first an insignia of the subjection of the Chinese to the Manchus. Buddhism in the Chinese form of to-day also dates from the Manchu conquest For the history of their conquest and rule in China see CHINA, History Consult Giles, China and the Manchus (Cambridge 1912), Kent, P H B, The Passing of the Manchus (London 1912); Ross, Manchus; or The Reigning Dynasty of China, their Rule and Progress (London 1891).

MANCINI, man-chē'nē, a name borne by the five nieces of Cardinal Mazarın. They were born in Rome and summoned by their uncle to Paris, where they played a conspicuous part in the court of Louis XIV during the early years of his reign They were: (1) LAURE (b. 1636; d 1657), the amuable and pious companion of Louis XIV's boyhood. She became the mother of Louis, Duke of Vendôme, one of the greatest generals of the Grand Monarque (2) MARIE (b. 1639; d. about 1715), for whom the king conceived a violent affection, but in 1661 Mazarin gave her in marriage to Prince Colonna, constable of Naples. (3) Olympe (b. 1640; d. 1708), a witty and attractive woman, who became wife of Eugène de Savoie-Carignar, Count of Soissons, and mistress of the queen's household (4) Hortense (b. 1646; d. 1699), the most attractive and beautiful of the In 1666 she left her husband, the Mancıni. Duke de Mazarın, and became one of the chief beauties of King Charles II's court The king pensioned her, and after the Revolution of 1688 she lived in retirement in Chelsea. (5) Marre Anne (b. 1649; d. 1714) was the wittiest and most vivacious of the sisters. In 1662 she married the Duke de Bouillon, and her salon became the center of social and intellectual life at Paris She patronized La Fontaine, Cornelle and Molière. She died in Clichy. Conneille and Molière. She died in Clichy. Consult Chatelauze, Louis XIV et Marie Mancini (Paris 1880); Williams, A. N., Fwe Fair Sisters (New York 1906).

MANCO INCA I, ing'ka, Peruvian ruler: b. about 1500; d. 1544. He was the second son of the inca Huayna Capac (q.v.), who died about 10 years after the first arrival of the Spaniards, dividing his kingdom between his legitimate successor, Huascar, and a younger son, Atahualpa. The latter, afer having made war upon Huascar, and put him to death, was himself captured and executed in 1533 by Pi1846 the remaining families of the tribe took up their residence at the Fort Berthold Reservation. The Mandans were not a nomadic people, but resembled the Pawnees, living in log houses with village administration and local government. They were an agricultural people, raising corn, tobacco and other crops.

MANDAN, N. Dak., city and Morton County seat; alt. 1,642 feet; on the navigable Missouri River, the Northern Pacific Railroad, and two airlines; 5m. W. of Bismarck. The city is situated in a wheat-growing and livestock-raising region, and is a Northern Pacific division point and car-shop center. The State Training School, for juvenile delinquents, is located here, and near by are the U.S. Northern Great Plains Experimental and Dairy Stations, and the Fort Lincoln State Park. In the park are the remains of a Mandan Indian village, an historical museum, and restored block houses. Mandan was settled in 1872, and incorporated as a city in 1891. It has commission government and a city-owned water system. Pop. (1940) 6,685.

MANDARIN, the term usually applied in China by foreigners to government officials of every grade. It is supposed to be derived from the Portuguese mandar, to command, or from the Sanskrit mantrin, counsellor; the Chinese equivalent is kwan, which signifies literally a public character. There are nine ranks, distinguished by different buttons.

MANDARIN DUCK, a small Chinese duck (Aix galericuta) closely related to the American wood-duck (A sponsa), and dressed in an exceedingly beautiful plumage of metallic green, purple, chestnut, white and black. It has long been domesticated by the Chinese, and as it is said to pair for life, is held up by them as a model of marital virtues; and it has been introduced upon park waters and ornamental grounds m America and Europe.

MANDAT, män-då, the name given to a kind of paper-money in the French Revolution. After the assignats, which had been kept in circulation by the violence of Robespierre, had lost all credit, a new money was created—the mandats—founded, like the assignats on the credit derived from the confiscated property, but with the essential difference that specific pieces of property, enumerated in a table, were pledged for the redemption of the bills, while the assignats furnished only a general claim. These mandats were issued in accordance with the law of 1796, to the nominal value of \$480,000,000. A forced circulation was given to them, by which the government was enabled to defray the expenses of the approaching campaign.

MANDATE, in law, a term derived from the Roman civil law. It may be defined as a bailment (delivery) of a chattel or chattels to a person who is to do something with or about the things bailed, entirely without compensation.

MANDATED TERRITORIES. The system of "mandates" as a substitute for the direct annexation of former German and Turkish territories, following the World War, was a creation of the Peace Conference at Versailles. These mandated territories are administered by the countries to which they are assigned under the supervision of the League of Nations. Ter-

ritory aggregating 1,250,000 square miles, with population of over 15,000,000 was placed under this form of government. These territories are divided into three classes: (A), those taken from Turkey; (B), former German colonies in Central Africa, (C), former German Southwest Africa and the former German possessions in the Pacific. The Allied and Associated Powers reserved the right to distribute these territories and to draft mandates before turning over the system to the League of Nations, and such a distribution was made on 7 May 1919. This covered the B and C mandates; the disposition of the A mandates was deferred until the San Remo Conference of premiers in April 1920. At this meeting Palestine and Mesopotamia were allotted to Great Britain, and Syria and Lebanon to France. The required drafts for each separate mandate having been prepared, the C mandates were approved by the Council of the League of Nations on 17 Dec. 1920. These gave former German Southwest Africa to the Union of South Africa, Nauru Island to the British Empire, New Guinea to Australia, Western Samoa to New Zealand, and the Caroline and Marshall Islands to Japan. Mandates of the B class were not approved until 1 Aug. 1922, when northern Kamerun was given to Great Britain, southern Kamerun to France, western Togoland to Great Britain, eastern Togoland to France, Urundi and Ruanda to Belgium, and German East Africa to Great Britain. For historical, political and sentimental reasons the A mandates formed the most interesting group France favored the inclusion of Palestine with Syria under her rule, and this arrangement, from a racial and territorial standpoint, was logical. The peculiar position and influence of Great Britain in Palestine made this impossible, and on 24 July 1924, mandates for Palestine to Great Britain, and Syria and Lebanon to France were confirmed by the Council. Conditions in Mesopotamia had created international complications, and the mandate for this territory was not approved until 1925, although Great Britain virtually held suzerainty over the country by virtue of the San Remo agreement. The Permanent Mandates Commission, appointed by the League of Nations, has general supervision over the mandates, and regular reports on the administration of the territories must be made to this body.

MANDAYA, män-dä'yä, a Philippine tribe of the Malay race living in the commandancia of Bislig, and the district of Dávao, island of Mindanao They are bloodthirsty and headhunters, mostly heathen, though Jesuit missionaries have converted some to Christianity (See Philippine Islands). Consult Cole, F. C., 'Wild Tribes of Davao District, Mindanao' (in 'Field Museum Publication 170,' Chicago 1913).

MANDEL, män'dĕl, Eduard, German engraver: b. Berlin, 15 Feb. 1810; d there, 20 Oct. 1882. He studied in Paris with Henriquel-Dupont, and in 1842 became professor of engraving at the Berlin Academy and director there after 1856. He was one of the greatest of modern German engravers, the most important work of his being the plate of Raphael's 'Madonna di San Sisto,' his latest effort. Other works are the plate after Hildebrandt's 'Warrior and Child' (1835); plate of Bega's

'Lorelei' (1837); Van Dyck's 'Portrait of Himself' (1841); 'Titian's Portrait of Himself' (1843); Van Dyck's 'Charles I' (1850). Raphael's 'Madonna Colonna' (1855); 'Frederick the Great'; 'Madonna della Sedia' (1865). Consult Pietsch, 'Eduard Mandel und seine Werke' (Berlin 1883).

MANDERSON, Charles Frederick, American lawyer and politician: b Philadelphia, 9 Feb 1837; d 1911. He received his early education in Philadelphia, removed to Canton, Ohio, in 1856, studied law and was admitted to the bar in 1859. He was city attorney in Canton, 1860-61, at the outbreak of the Civil War he enlisted as a private in the Union army, served in the campaigns in the Middle West and rose through the intermediate grades to the rank of brigadier-general of volunteers. He was severely wounded at the battle of Lovejoy's Station, Ga, and resigned from the army in 1865 on account of his wounds. He resumed his law practice in Stark County, Ohio, but removed to Omaha, Neb, in 1869. Here he soon became prominent in public affairs, was city attorney for more than six years and a member of the Nebraska Constitutional Conventions on 1871 and 1874 In 1883 he was elected to the United States Senate, serving until 1895, and being chosen speaker pro tem in two Congresses, 1889-93 After 1895 he was solicitor for the Burlington system of railroads, west of the Mississippi; and was president of the American Bar Association in 1900-He published 'The Twin Seven Shooters' (1902), and several addresses on political and legal subjects

MANDEVILLE, Bernard de, English writer: b. Dort, Holland, c. 1670; d. London, 21 Jan. 1732 or -33. He was educated at the Erasmus School, Rotterdam, and at the University of Leyden, where, in 1691, he received the degree of doctor of medicine. The date and occasion of his removal to England are unknown; but he appears soon to have settled in London where with but small success he practised his profession. He lived obscurely, with distillers and Dutch merchants as his ordinary acquaintances. Franklin, in his 'Autobiography,' records that in 1725, at "the Horns, a pale-ale house in — Lane, Cheapside," he was introduced "to Dr. Mandeville, author of the 'Fable of the Bees,' who had a club there, of which he was the soul, being a most facetious, entertaining companion." Franklin at this time was merely a struggling young printer, unknown to fame: Mandeville gained no honor from his acquaintance. Mandeville had, however, a few acquaintances outside his tavern circle. Of these, the most important was Lord Macclesfield, the chief justice, at whose house Mandeville also met Addison. Of their world, however, Mandeville was never a real part, socially or intellectually.

Mandeville wrote much both in verse and prose; but his chief claim to notoriety was the authorship of the 'Fable of the Bees.' This, in its earliest form, consisted solely of a rude poem, in octo-syllabic couplets far from Miltonian, entitled, 'The Grumbling Hive, or Knaves turned honest.' In it, he related how, so long as they remained unscrupulous, the bees increased in numbers and prosperity, and how

by their moral reformation the bees gained only their material ruin. He concluded that

"To enjoy the world's conveniences, Be famed in war, yet live in ease, Without great vices is a vain Utopia, seated in the brain. Fraud, Luxury, and Pride must live, While we the benefits receive"

Of this piece, the earliest known edition is that of 1705. Mandeville's assertion that an earlier edition was printed is unsupported by evidence. In 1714, Mandeville reprinted the poem with prose additions, the whole bearing the new title 'The Fable of the Bees, or Private Vices Public Benefits.' This he further enlarged in the edition of 1723.

At this point, the grand jury of Middlesex interfered, and, in July 1723, presented the 'Fable' as a nuisance Immediately the book became a subject of general attack Richard Fiddes and John Dennis in 1724, William Law, Francis Hutcheson in 1725-27, Arichibald Campbell in 1728 and Bishop Berkeley in 1732, all assailed Mandeville in turn By Law and by Berkeley, Mandeville was intellectually outclassed; but he held up his side of the argument, adding to his 'Fable,' in successive editions, tract after tract. That the 'Fable' should be thus attacked is not surprising. Its fundamental thesis, that private vices are public benefits, was as subversive of morality as its illustrative material was foul and its style plausible and forceful Whether Mandeville was sincere or ironical in his argument is in dispute. That he thoroughly enjoyed his own foulness cannot be doubted. But at least he accomplished one good thing; he pricked the sham morality of Shaftesbury. Other works by Mandeville are 'Esop Dressed, or a Collection of Fables Writ in Familiar Verses' (1704); 'Free Thoughts on Religion' (1720); 'Enquiry into the Causes of the Frequent Executions at Tyburn' (1725). Consult Robertson, J. M., 'Proneer Humanists' (London 1907).

MANDEVILLE, SIR John. The alleged author of a mediæval book of travels which enjoyed great popularity. A large number of manuscripts are in existence, the most important of which are in Latin, French and English The earliest version is in French, dating from the latter part of the 14th century, and upon this all the others appear to be more or less directly based There is no English manuscript antedating the 15th century. The statescript antedating the 15th century. The statements in the prologue regarding the translation are to be distrusted, and the autobiographical matter is contradictory. An exaggerated importance has sometimes been attached to the compiler of the work as the father of English prose, because of the statement in one of the English manuscripts that he had translated it out of French into English in order that every man of his nation might understand it. Errors in the translation prove that the man who wrote the French version and the man who made the English rendering cannot have

The travels consist, in the main, of an account of the Holy Land and the routes thither, followed by a description of various parts of Asia. The narrative is almost wholly spurious, being made up of paraphrases and borrowing from various sources—travel-books, bestiaries, works on Eastern manners, legends, romances,

The first half of the book is chiefly dependent upon the travels of William of Boldensele, a German who flourished in the 14th century, and the second part upon the work of Friar Odoric of Pordenone (about 1330) only portions which may reflect personal experience are those dealing with Jerusalem and Egypt, which it is not impossible that the compiler may have visited. The story abounds in all kinds of adventures and marvels, related with an air of sober truth. There are accounts of monsters and curiously misshapen men, of regions haunted by devils, of the Fountain of Youth, of the Phœnix, of the realm of Prester John, etc The narrator must have been a man of wide reading, and he certainly displays considerable skill in the selection and arrangement of his materials

In the prologue the author states that his name is "John Maundeville, knyght," b at Saint Albans, England, and that he "passed the see," in 1322 (1332), whereupon he traveled through various countries The epilogue asserts that the gout forced him to return, and that he occupied his leisure in writing his experiences It has been found impossible to identify him_with any historical John Mandeville

The tomb of the reputed author of the 'Travels' was long shown at Liège, with an inscription to "Joannes de Mandeville, alias dictus ad barbam." Important in this connection is the testimony of one Jean d'Outremeuse, in a 'Myreur des Histors,' now lost, to the effect that there died in Liège, in 1372, a physician named Jean de Bourgogne, "dit à la barbe," who declared himself on his death-bed to be "Jean de Mandeville, chevalier, comte de Mont-fort en Angleterre," his real name having been concealed because of a crime committed in England. The veracity of D'Outremeuse is open to suspicion, but it has been thought that this Jean de Bourgogne may have been one John de Burgoyne, who was forced to leave England in 1322, and that he compiled the 'Travels,' borrowing the name of one John de Mandeville, who was concerned in the murder of Gaveston At all events, Jean de Bourgogne was known in mediæval times as the author of a treatise on the plague, which is bound up in one instance with a yersion of the 'Travels' It seems probable, then, that this man, whatever his past history may have been, was the real author of the latter work, and that he preferred to con-ceal his identity under the pseudonym of Mandeville

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MANDINGOES, mān-dēng'gōz, a linguistic group of West Africa, remarkable for their intelligence The original country of this peo-ple was the north slope of the high table-land of Senegambia, between the head-waters of the Niger and Senegal. Their language is more widely diffused, and more employed by translators than that of any of the other languages of West Africa. They formed at one time a single large empire but one now widely scat. single large empire, but are now widely scattered. The hair is woolly but other facial

negro characteristics are absent. From the Arabs they have derived a high degree of culture and are far removed from savagery. Their religion is Mohammedan Consult Johnston, Sir H H, 'Liberia' (2 vols, London 1906)

MANDIOCA, the staple food of Brazil See Cassava

MANDOLIN, a musical instrument, belonging to the lute species, played with a guill or plectrum as well as with the finger. It is of Italian origin, but latterly has become com-mon in all civilized countries. In the usual form it has four pairs of metallic strings and a finger-board or neck with numerous frets across it Operatic composers have occasionally employed the mandolin to obtain characteristic effects. The commonest form of this instrument is the Neapolitan with a range G-E3. Other varieties are the Milanese with six strings, the Spanish with six double strings and the Turkish with seven double strings There are four double strings in the Neapolitan.

MANDRAGORA. See Mandrake.

MANDRAKE, a genus of perennial herbs (Mandragora) of the order Solanacea The species, of which only three are described, are almost stemless, thick-rooted and large-leaved, with rather large whitish or bluish bell-shaped flowers, followed by globular berries. The plant is chiefly interesting from the numerous allusions to it an old writings, the superstitions relating to it being mainly in connection with its fetid, reputedly poisonous root, which, from a fanciful resemblance of its roots to the human figure, was considered an aphrodisiac

The May-apple (Podophyllum peltatum), of the order Berberidaceæ, is often called "mandrake" in the United States, where it is common east of the Mississippi River It is a perennial herb which sends up umbrella-shaped leaves, usually two at the summit of a stem and bearing one or two creamy, fragrant flowers in the axil. A mawkish yellow fruit about the size of a large cherry develops during early summer_ The fruits "are relished by pigs and summer The fruits "are relished by pigs and boys" The creeping rootstocks have been used medicinally

MANDRILL, the largest and one of the most repulsive and savage of the African baboons (See Baboon). Consult Drill

MANED WOLF, a long-legged, slender-bodied, long-nosed, brightly reddish wolf (Canis jubatus) of eastern South America, which may be regarded as one of the "aguaras" or foxdogs (qv). It is a denizen of forests, not being known south of the northern edge of the Argentine pampas; and goes about alone at night and secretly, seeking its food, which consists mainly of small rodents, frogs, insects and the like, and even some fruit. It will sometimes attack sheep, but is remarkably timid, and no one fears it

MANES, mā'nēz, among the Romans, the souls of the dead. The good spirits were also called lares, and the evil larvæ. The manes were reckoned among the infernal gods; but a belief was prevalent that they sometimes appeared upon the earth in the form of ghosts, particularly on the 30th of August, 4th of October and 7th of November; whence the Romans considered these unlucky days. MANES WORSHIP, from Roman Manes (qv.), a term to denote the worship of the dead, whether of an ancestor of the particular worshiper or of some deified hero of his race. Herbert Spencer thinks it developed from the belief in an other self, which survived after death, and the manes worship was the outcome of a desire and endeavor to propitiate the ghost. Sir John Lubbock says of manes worship that it "is natural development of the dread of ghosts"

MANET, ma'na', Edouard, French artist: b. Paris, 23 Jan. 1832, d. Paris, 30 April 1883. Originator of the Impressionist movement, which finds its greatest expression in Claude Monet, Manet worked in an original manner before Impressionism was thought of. He rendered great service to the movement, not solely by his works, but by taking upon himself the criticisms directed upon the whole Impressionist School. Dégas, Monet and Renoir, bold in art but timid of nature, resigned themselves to the misunderstanding and hostility of the public; but the more courageous Manet defended the movement with a strong controversial pen. He fought valiantly for himself and all the artists associated with his name

Manet studied with Couture about 1850 and traveled throughout Europe, growing enthusiastic over Rembrandt, Tintoretto, Velasquez and Goya, painted some fine works such as the 'Buyeur d'absinthe' and the 'Vieux musicien' and in 1861 exhibited at the Paris Salon portraits of his parents and the 'Guiterero.' His 'Déjeuner sur l'herbe' attracted much attention. 'Olympia' (in the Luxembourg) attracted more hostile criticism. It was a technical experiment significant for the period of its composition. 'Angels at the Tomb of Christ,' 'Lola de Valence,' 'Toréador tué,' 'Acteur tragique,' 'Jésus insulté,' the 'Gitanos,' 'Rouvière' and portrait of 'Eva Gonzalès' appeared before 1870. About this time Manet cast his lot with the Impressionists. The 'Fight of the Kearsarge and the Alabama' announced this transformation of his style and was followed by 'Musique aux Tuileries,' the 'Bal de l'Opéra,' the 'Bon Bock' and the 'Liseur.' 'Argenteuil' (1875) shows his atmospheric researches. Next came a portrait of 'Desboutin' and the 'Linge' (1876), a portrait of 'Faure' as "Hamlet" (1877); 'La Serre,' a symphony in blue and white in which George Moore, the author, appears in boating costume (1878); the scene in the 'Père Lathuile Restaurant' (1880); 'Portrait of Rochefort' (1881); and the 'Bar des Folies Bergère' (1882).

"This work of Manet," writes a French critic, "so much discussed and produced under such tormenting conditions, owes its importance beyond all else to its power and frankness." Ten years of developing the first manner, tragically limited by the war of 1870; 13 years of developing the second evolution, parallel with the efforts of the Impressionsts The period from 1860 to 1870 is logically connected with Hals and Goya; from 1870 to 1883 (when he died) the artist's work is complicated by the study of light He had all the pictorial gifts which make the glory of the masters — full, true, broad composition; coloring of great power; blacks and greys, which cannot be found often

elsewhere than in Velasquez and Goya; and a profound knowledge of values. He tried his hand at everything. portraits, landscapes, seascapes, scenes of modern life, still life and under each in turn served his ardent creative brush His pictures will always remain documents of the greatest importance on the society the manners and customs of the Second Empire. A beautiful painter is what he was hefore everything else. It is almost inconceivable that the juries of the Salons failed to understand him. They waxed indignant over his subjects which offer only a restricted interest and they did not see the altogether classic quality of this technique without self-glorification, without tricks, without bitumen, of this vibrating color; of this rich paint, of this passionate design so suitable for expressing movement and gestures true to life; of this simple composition where the whole picture is based upon two or three values with the straightforward. ness one admires in Rubens, Jordaens and Hals Manet occupies an important place in the French School He is its most original painter of the second half of the 19th century, the one who has really created a great movement His work, the fecundity of which is astonishing is unequalled

MANETHO, or MANETHO SEBEN. NYTA, Egyptian historian: native of Sebennytus, in the Delta, and of the priestly order. He is believed to have lived in the reigns of Ptolemy I and II and to have written in the reign of Ptolemy I (323–285 BC), or of Ptolemy II (285–247 BC) According to some he was priest of Diospolis or Heliopolis; others contend that he was high-priest of Alexandria His name has been interpreted variously as "Beloved of Thoth" or "Beloved of Neith." Scarcely anything as known of the history of Manetho himself, and he is renowned chiefly for his Egyptian annals. On the occasion of Ptolemy I dreaming of the god Serapis at Sinope, Manetho was consulted by the monarch, and in conjunction with Timotheus of Athens, interpreter of the Eleusinian mysteries, de-clared the statue of Serapis, brought by orders of the king from Sinope, to be that of the god Serapis or Pluto; whereupon the god had a temple and his worship inaugurated at Alexandria. The fame of Manetho was much increased by his writing in the Greek language, and so being enabled to communicate from Egyptian sources a more correct knowledge of the history of his native country than the Greek writers who had preceded him. Of this history, only extracts given by Josephus in his work against Apion, and an epitome by Euse-bius and other ecclesiastical writers, remain. It appears to have been written in a compendous annalistic style of narrative, resembling the accounts given by Herodotus. The work of Manetho was in three books, the first began with the mythic reigns of gods and kings and ended with the 11th dynasty of montals; the second continued the history from the 12th to the 19th dynasty; the third from the 20th to the 30th dynasty, when Egypt fell under the dominion of Alexander the Great. The reigns of the gods are given as amounting to 24,900 years, and the epoch of Menes, founder of the monarchy, commenced 3,555 years before Alexander (332 B.C.). The difficulties attending the

reconciliation of this chronology with the synchronestic history of the Hebrews, Greeks and other nations, have given rise to numerous speculations and chronological systems since the earning The accession of newer information from the original revival of learning and better information from the original sources of Egyptian monuments, papyri and other documents has considerably enhanced the general value of the history of Manetho, which, prior to their discovery, had fallen into discredit. But the restoration of the history of Manetho, notwithstanding all these resources and the positive epoch of the monarchy, are still to be sought, though certain dynasties, in the second and third books of his works, can be reconciled with monumental evidence. Besides the true work of Manetho above cited, another work, 'Sothis,' or the 'Dogstar' (in allusion to the cycle of heliacal rising of that star of 1461 years) dedicated to Sebastos or Augustus, the title of the Roman emperors, has been handed down; but there is considerable support for the opinion that it is spurious, and was added by the epitomizers; and another work, called the 'Old Chronicle,' in which the history was arranged according to cycles, was compiled by them. Besides the history, Manetho wrote 'Ton Physikon Epitome,' treating on the origin of gods and the world and the laws of morality; or gods and the world and the laws of morality; and another work on the preparation of the sacred kyphi, a kind of frankincense. The astronomical work called 'Apotelesmata' is a spurious production of the 5th century after Christ. Consult Boekh, 'Manetho' (Berlin 1845); Bunsen, 'Egypt's Place in Universal History' (London 1848-67); Muller, C, 'Historici Græci Minores' (2 vols., Leipzig 1870-71). 71).

MANEY, George, American soldier and diplomat b Franklin, Tenn, 24 Aug. 1826; d. Washangton, D. C., 9 Feb 1901. He was educated at the University of Nashville, fought in the Mexican War (1846-47), in 1849 was admitted to the bar and in 1849-61 practised law. On 1 May 1861 he became colonel of the First Tennessee Infantry, and at Shiloh (6-7 April 1862) he commanded first his regiment and later the 2d brigade of the 2d division. Promoted brigadier-general for his conduct at Shiloh, he commanded the 3d brigade of Cheatham's division in Bragg's army at Murfreesboro (31 Dec.-3 Jan 1863) and Chickamauga (19-20 Sept. 1863), subsequently was appointed to the command of Cheatham's division and participated in the battle of Atlanta (22 July 1864) In 1876 he was nominated by the Republican party for the governorship of Tennessee, but before the election retired from the contest He was Minister to Colombia in 1881-83, and to Paraguay and Uruguay in 1889-93. In 1884 and 1888 he was a delegate to the Republican National conventions of those years In 1868-77 he was also president of the Tennessee and Pacific Railway.

MANFRED, king of Naples and Sicily, 1258-66: b. about 1231; d. 26 Feb. 1266 He was a natural son of the Emperor Frederick II, on whose death, in 1250, he became Prince of Tarentum, and acted as regent in Italy in the absence of Conrad IV, his half-brother. After the death of Conrad he was regent of the kingdom during the minority of his nephew Conradin. At the instigation of Pope Alex-

ander IV a crusade was preached against him, and Manfred was temporarily driven from his kingdom, which, however, he soon recovered, and on the rumored death of Conradin had himself crowned king of Palermo, 10 Aug. 1258. The Pope at once excommunicated him and his followers, but Manfred marched into the papal territory and compelled acknowledgment as master of Tuscany. Through matrimonial alliances for himself and his daughter he sought to increase his power, and his administration of the government was efficient, beingn and for a time prosperous But the excommunication was renewed by Pope Urban IV, who also bestowed his kingdom on Charles I of Anjou, and a war ensued in which Manfred was finally defeated and killed at Benevento. After his death imprisonment and extreme cruelty were visited upon his widow and children.

MANFRED. Lord Byron's powerful and imaginative "witch-drama," (Manfred) (1817), was composed under the spell of the aweinspiring scenery of the Alps, which Byron had visited in 1816 on the tour through Germany and Switzerland recorded in the third canto of 'Childe Harold' The hero is a sort of combination of Faust and of the Byronic type portrayed in the earlier verse tales, a lofty and defiant spirit, dwelling alone in a dark castle among the higher Alps, haunted by remorse for an act the nature of which we are left to guess. Seeking to interview the spirit of the dead Astarte, the victim of his crime, and to obtain her forgiveness, he calls up the spirits over whom he has control and at length resorts to the abode of the evil principle itself. The ghost is evoked, but returns an ambiguous answer to his question On the morrow Manfred expires, after resisting a summons to repent from the old abbot of Saint Maurice and defying the demons who have come to possess his soul. Some biographers have seen in the poem a reflection of its author's relation with his half-sister, Aurora Leigh. In any case Byron has made his hero in his own image, infusing into him the characteristic Byronic spirit of proud rebellion and passionate despair. In style the poet aims at and partly succeeds in achieving an imaginative grandeur commensurate with his superhuman theme. 'Manfred' attracted the favorable notice of Goethe, to whose 'Faust,' translated in his presence by Monk Lewis in 1816, Byron is indebted for some of the essential elements in his drama. Consult 'The Works of Lord Byron' (edited by R. H. Prothero); and 'Cambridge History of English Literature' (Vol. XII). JAMES H. HANFORD.

MANGABEY, mang'ga-ba, one of the odd West African monkeys of the genus Cercocebus, nearly related to the guenons and to the macaques. They are distinguished by the whiteness of the eyelids and the backward growth of the hair on the crown of the head. Some of the species are well known, especially the sooty mangabey (C. fuliginosus) which always carries its long tail turned over its back. There are three or four species and they make docile pets

MANGALDAN, män-gäl-dän', Philippines, a pueblo of the province of Pangasinán, Luzon, situated 12 miles northeast of Lingayén, the

provincial capital. It is on the coast road and is the meeting point of several roads extending to towns in the interior, and is on the route of the railroad from Dagupan to Manila Pop. ' 15,800.

MANGALORE, măng-ga-lōr', India, a seaport town, on the Malabar coast, capital of the district of South Kanara, Madras presidency. It is clean and well built, surrounded by groves of coconut palms and stands on the edge of a fine salt-water lake or back-water formed at the mouths of two rivers. The port will not admit of vessels drawing more than 10 feet of water, except in spring tides; but there is good anchorage off the mouth of the river, in five to seven fathoms Tile-making is an important industry. The exports are principally coffee, rice, sandal-wood, cassia and turmeric; the imports sugar, salt and piece-goods There is a Roman Catholic college, and the Basel Lutheran mission in India has its headquarters here. The Roman Catholics have a bishop and several churches, a considerable number of the natives belonging to this faith. It was captured by the Portuguese in 1596 a.D., and by the English in 1668, finally falling into British possession in 1799. Pop. about 53,000.

MANGANESE, măn-ga-nēs', a metallic element which is widely distributed in nature, though it never occurs except in combination with other elements. The dioxide was believed to be a compound of iron until 1774, when Scheele proved it to be a compound of a previously unknown metal, and in the same year Gahn prepared the element in its metallic form. It was first called "magnesium," from the fact that it was prepared from a compound then called "magnesia nigra" (and now known as manganese peroxide or dioxide); but in 1808 the name was arbitrarily changed to "manganese,"

by Buttmann. Manganese may be prepared in the metallic form by reducing any of its oxides with carbon at a white heat, and this is the method followed commercially. For experimental purposes, however, it is easier to obtain it by reducing the chloride with metallic sodium or magnesium. The physical properties of manganese vary somewhat according to the precise way in which the metal is obtained. Its melting-point may be taken as 3500° F, its specific gravity as 7.4 and its specific heat is 0122. It is a gray, hard, brittle, lustrous metal, suscepti-ble of taking a high polish, and resembling iron in most respects, both physically and chemically. It is not magnetic, however The pure metal does not appear to be affected by dry air, but moist air oxidizes it, at least superficially. Some authorities describe it as oxidizing readily in common air, and as decomposing water with almost as great a facility as potassium; but it appears probable that the specimens from which these results were obtained contained impurities of some sort. Metallic manganese is not used in the arts, but some of its alloys with iron, aluminum and copper are valuable. It is particularly valuable in steel, its presence in small amount increasing the hardness, tenacity and elasticity of the metal. It is added to the molten steel, in the process of manufacture, in the form of an iron-manganese alloy containing from 10 to 80 per cent of the latter metal, and known in the arts as "spiegeleisen" or "ferromanganese." The "manganese" of commerce is usually not the metal itself, but a mixture of its oxides. Manganese is used in the steel industry almost entirely in the form of two alloys, ferromanganese and spiegeleisen These are both alloys of iron, manganese and carbon Ferromanganese may contain as much as 80 per cent of manganese, but averages in this country about 70 per cent In spiegeleises the percentage of manganese is much lower; the standard figure upon which the price is based is 20 per cent. The average mangarest content is about 18 per cent. Both alloys are runs up to 7 per cent. The manganese alloys are added to molten steel from the conveter, or open hearth furnace, for the purpose of intioducing both manganese and carbon. The manganese cleanses the steel by combining with the contained oxygen and, to some extent, with the sulphur, and then carries these impurites into the slag. The carbon is for the purpose of giving the steel the required hardness and strength. By adding larger amounts of the alloys, manganese steel is produced, which is noted for its hardness, tenacity and durability It is much used in the wearing parts of heavy machinery In recent years the tendency has been to use more ferromanganese and less spiegeleisen, on account of the much smaller amount of ferromanganese that it is necessary to add to the steel. Spiegeleisen usually has to be melted in a cupola furnace before using but ferromanganese can be added direct The latter also introduces less carbon, which some times is an advantage Ferromanganese and spiegeleisen are produced by smelting a mixture of manganese ore and iron ore in an ordinary blast furnace A high temperature is required and the amount of fuel used is much greater than in iron smelting. A considerable amount of the manganese goes into the slag. The slag from a ferromanganese furnace may contain as much as 10 per cent of manganese A considerable tonnage of the iron manganese alloys is now produced in the electric furnace.

Chemically, manganese is a dyad. It has the symbol Mn, and an atomic weight of 55 if O=16, or 546 if H=1. It forms numerous oxides, the best known of which are (1) the monoxide, MnO, from which the manganous salts may be prepared, and which is itself obtained by heating manganese carbonate out of contact with the air; (2) the sesquioxide, Mn₂O₃, which exists in nature as the mineral braunite, and which is also formed when the monoxide is heated in air to a red heat; (3) the red or mangano-manganic oxide, Mn₃O₄, which corresponds to the magnetic oxide of iron, does not form salts, and exists in nature as the mineral hausmannite; (4) the black oxide, or dioxide, MnO₂, which occurs in nature as pyrolusite and varvacite, and which is largely used in the arts in the preparation of oxygen and chlorine; (5) the trioxide, MnOs, which is difficult of preparation and very unstable; and (6) the heptoxide, Mn₂O₇, a heavy, dark green liquid prepared by treating potassium permanganate with cold concentrated sulphuric acid. Several of these oxides also occur in a hydrated form, as minerals Of the soluble manganous salts, the chief representatives are the sulphate and the chloride. Manganous sulphate, MnSO, is prepared by treating the dioxide with sulphuric acid, oxygen being liberated at the same time in accordance with the equation MnO₂+H₂SO₄=MnSO₄+O+H₂O It crystallizes with five molecules of water, as a pink-colored salt, and is used in dyeing and in medicine. The chloride, MnCl₂, crystallizes with four molecules of water, and is obtained as a by-product in the manufacture of chlorine by the action of hydrochloric acid upon manganese dioxide. It is used in calcico printing. Of the insoluble manganese salts we may specially note the sulphide and the carbonate. The sulphide, MnS, is thrown down as a flesh-colored precipitate, when a soluble manganous salt is precipitated by an alkaline sulphide. The carbonate, MnCO₃, occurs native as the mineral rhodochrosite, and it may also be obtained as a white precipitate by adding an alkaline carbonate to a solution of manganeous sulphate or chloride.

Two other important classes of manganese compounds are known, in which the manganese does not act as a base, but as an acid-forming element. These are the manganates and permanganates, which may be regarded as the salts or "manganic acid," H₂MnO₄, and "permanganic acid," HMnO₄, respectively The potassum salts of these acids are by far the most important ones Potassium manganate, K2MnO4, may be prepared by melting manganese dioxide with caustic potash and a little potassium chlorate, dissolving the bright green mass so obtained in a small quantity of water, and crystallizing by evaporation in a vacuum. Potassium manganate is used in laboratory operations, but it is very unstable, taking up oxygen with great readiness, and depositing hydrated dioxide of manganese If the green solution containing potassium manganate be allowed to stand in the air, it absorbs oxygen, changes in color to a bright purple and deposits hy-drated manganese dioxide. The purple color is due to the presence of potassium permanganate, KMnO4, which may be obtained, by crystallization, in the form of purple prismatic crystals. Potassium permanganate is a powerful oxidizing agent, and is extensively used in chemistry, in the arts and in medicine, on account of the facility with which it parts with oxygen, especially in the presence of organic matter. It forms the basis of "Condy's fluid," which is largely used as a disinfectant.

The chief ores of manganese are the black oxide pyrolusite (MnO₂, 63 2 % Mn); psilomelane (MnO₂ H₂O, 45-60 % Mn); braunite (3 Mn₂O₃ MnS₁O₃, 69 7 % Mn); wad which is an earthy oxide (Mn 15-40 %); manganite (Mn₂O₃.H₂O, 62 4 % Mn); rhodochrosite (MnCO₃, 61 7 % MnO), and franklinite [(Fe3nMn)O(FeMn)₂O₃]. The ores are often associated with other metals, particularly with iron oxides, and with silver ores Like residual limonite (see Iron Ores) manganese ore is usually secondary, resulting from the removal of more soluble substances during the weathering of slightly manganiferous rocks. For many years prior to 1914 Russia was by far the greatest producer of high grade manganese ores. Most of this output came from one locality near Chiatouri, south of the Caucasus Mountains. Some engineers have estimated the total reserves of high grade manganese ore in this one district to be upward of 100,000,000 tons, although this has been disputed. For some time before the war Russia's production averaged

more than half a million tons yearly. Next in importance to Russia as sources of manganese are Brazil and India In Brazil there was a rapid development of the industry and the production of manganese ore in 1917 was about 500,000 tons As the war practically stopped the exportation of manganese from Russia and India, the deposits in Brazil assumed great importance, but in 1924 exports fell to 151,043 The United States has never been a large producer of manganese ore. A writer in the Mineral Industry some years ago stated that the manganese output of the country was "insignificant because of the trifling character of the deposits." In 1914 the total production in the United States of ore containing 40 per cent or more of manganese was only 2,635 long tons In the production of ferromanganese and spiegeleisen and in the other arts using manganese compounds it is desirable to have an ore containing at least 40 per cent of the metal. Before the late war it was almost impossible to find a steel maker willing to buy a lower During the war some steel makers bought ore containing only 28 per cent man-ganese and were glad to get it. Most of the manganese bearing ores mined in the United States are classified as manganiferous iron ores, which may or may not contain silver and lead. In these ores the manganese is mainly valuable as a flux in smelting operations, although it can sometimes be used for making spiegeleisen. The domestic shipments of manganese containing 35 per cent and more of metallic manganese amounted in 1937 to 40,241 tons, having a value of \$1,062,399. Production was lower than the 1925-29 average which was 59,312 tons but there had been a steady increase after 1933 when total production was 19,146 tons. Largest output came from Montana. The production of manganiferous iron ore containing from 10 to 35 per cent manganese in 1937 was 151,955 long tons valued at \$778,840 Production of ore containing from 5 to 10 per cent manganese was 1,189,017 long tons with a value of \$3,078,919. Imports of manganese in 1937 totaled 911,922 long tons, valued at \$10,451,602. Largest imports were from Cuba and the Gold Coast. The domestic deposits are in many States, of which the most important are Arizona, Arkansas, California, Colorado, Georgia, Minnesota, Montana, Tennessee, Utah and Virginia. In 1910 the United States Geological Survey issued a very excellent monograph, Bulletin No. 427, entitled 'Manganese Deposits of the United States,' by Edmund Cecil Harden, giving very complete data in regards to ores, alloys, production and uses. The same author contributed a paper entitled 'Manganese Ores of Russia, India, Brazil and Chile,' to the 'Transactions of the American and Chile,' to the 'Transactions of the American Institute of Mining Engineers' (Vol. LVI, p. 31). In the same volume there is an article by Joseph T Singewald, Jr., and Benjamin Leroy Miller on 'The Manganese Ores of the Lafayette District, Minas Geraes, Brazil.' In the Engineering and Mining Journal (18sue of 9 Feb. 1918) is a popular article by Henry V. Maxwell entitled 'Prospecting for Manganese.' See METAL LURGY; STRATEGIC AND CRITICAL MINERAL SUP-PLIES.

MANGANESE BRONZE, a metallic element in which the copper forming the base of the alloy is mixed with a certain proportion of ferro-manganese, and which has exceptional qualities in the way of strength and hardness. Various qualities are manufactured, each suited for certain special purposes. One quality, in which the zinc alloyed with the treated copper is considerably in excess of the tin, is made into rods and plates, and when simply cast is said to have a tensile strength of about 24 tons per square inch. Another quality has all the characteristics of forged steel without any of its defects. Another quality is in extensive use for toothed wheels, gearing, brackets and all kinds of machinery supports. From its non-hability to corrosion it is largely employed in the manufacture of steamship propellers.

MANGANITE, native hydrated oxide of manganese, MnO (OH), or Mn₂O₃ H₂O. It crystallizes in the orthorhombic system, but also occurs in columnar and stalactitic forms It is buttle, and has a hardness of 4 and a specific gravity of about 43. It is steel gray to iron black in color, and opaque with a submetallic lustre It occurs in the Harz region, in Norway and Sweden and in the British Isles In the United States it is found in the Lake Superior mining district, and in Douglas County, Colo. It also occurs in Nova Scotia and New Brunswick Manganite is used as a source of manganese for the preparation of spiegeleisen and other alloys, and also in the manufacture of pigments and dyes.

MANGASARIAN, Mangasar Mugurditch, American author and lecturer: b Mashgerd, Armenia, 29 Dec. 1859. He was educated at Robert College, Constantinople, 1872-76 and at Princeton Theological Seminary He entered the Presbyterian mimstry in 1882 and held a pastorate in Philadelphia 1882-85, when he resigned to become an independent preacher and lecturer. In 1900 he organized the Independent Religious Society, Rationalist, at Chicago, and was its lecturer until 1925. He is the author of 'A New Catechism' (1902); 'The Truth about Jesus' (1909); 'How the Bible was Invented' (1910), 'The Crisis of the Churches,' and numerous other works on religious topics

MANGATAREN, män-ga-ta'ren, Philippines, a pueblo of the province of Pangasinán, Luzon, 18 miles south of Lingayén; it is on the Agno River road Pop. 10,150

MANGE, a cutaneous disease to which dogs, horses, cattle, etc., are liable. It resembles in some measure the atch in the human subject, ordinary mange being due to the presence of a burrowing parasite. Both local application and internal remedies are used in its cure. Frequent washing of the skin is essential. See ITCH

MANGEL-WURZEL. See BEET.

MANGIN, Charles Marie Emmanuel, French general: b. 6 July 1866; d. Paris, 12 May 1925. He served from his 24th year in Tonkin and in every part of Northern Africa, and accompanied Marchand on his historic journey from the Congo to the Nile in 1898. He first came under public notice in 1911, when, as military instructor to the Moroccan forces of Sultan Mulai Hafid, he defended Fez against the rebellious Berber tribes In August 1912 he led a flying column of 4,000 men from Fez to Marakesh, effecting a dramatic rescue of nine French prisoners held by the pretender El Hiba. He received the congratulations of his

government and was made a commander of the Legion of Honor. At the outbreak of the European War he was given a brigade command in the 5th Army, which took the shock of the first German onset at Charlesoi At the Marne he led a division and was heavily engaged at the battle of the Aisne After participating in various other battles he arrived at Verdun with his division in March 1916 Here he led his men to the recapture of La Caillette Wood and (22) May) to the brilliant but shortlived reconquest of Douaumont. He was placed in command of the new 3d Colonial Corps in June and given charge of the crucial sector on the right bank of the Meuse. In October his command recaptured Douaumont and also Fort Vaux, with nearly 5,000 prisoners. He deprived the Germans of a wide sweep of territory around Verdun in December, and in the spring, conducted a big offensive between Soissons and Rheims, which was suddenly stopped Mangin was relieved of his command and relegated to an obscure post through a cabinet crisis With the accession of Clemenceau, Mangin was sent back to the field In the summer of 1918 he com-manded the French-American forces operating between the Aisne and the Marne In 1919 he commanded the French army of occupation, and in 1921 was sent to South America.

MANGLE, a machine for smoothing linen and cotton goods See LAUNDRY MACHINERY

MANGO, măn'gō, a genus of trees (Mangifera) of the family Anacardiaceæ. The 30 species are natives of southeastern Asia, where some of them have been distributed by man throughout the tropics of both hemispheres The wood of various species is used for boat and canoe making, for house building and for boxes. It is gray, rather soft and easily worked. The trees are valued also for shade, being of large size and attractive form, and very leafy, the leaves large, leathery and evergreen. It is for their fruits, however, that they are most esteemed. These are widely used for human food, especially in the East, either ripe, in which condition they are eaten raw, with or without wine, sugar and spices, or unripe as preserves, jellies or pickles. They are also used for making wine and glucose. The finer varieties are considered equal to the choicest pineapples and even to the mangosteen.

The most commonly planted and most widely distributed species is the common mango (Mindica), a native of India It often exceeds 40 feet in height, bears terminal panicles of rather small pinkush or yellow flowers, followed by smooth kidney-shaped yellow or reddish fruits which often weigh more than half a pound. Each fruit contains one large flattened seed, almost as long and often nearly as wide as the fruit, but flattened like the seed of a melon. The kernel is often roasted and eaten like chestnuts The pulp of the fruit is soft, luscious in the finer varieties but very fibrous in the infenior sorts. These have a more or less pronounced flavor, suggestive of turpentine, which is characteristic of all parts of the tree. Since 1782, when the mango was introduced into Jamaica with a lot of other plants taken from a French vessel captured on its way to Haiti, the fruit has spread throughout the West Indies and southern Florida. In Florida, however, the

freeze of 1886 destroyed all trees except those in the extreme southern part, where the mango is now confined The market, which seems to be growing but is somewhat limited because of the prevailing ignorance regarding the fruit, is supplied mainly from the West Indies California supplies little more than its home markets. The trees do best upon well-drained sandy land, and should be well supplied with potassic manures. They quickly fail to bear upon wet soils. They may be propagated by grafting, but since a large proportion of the varieties reproduce practically without change by seed this method is widely employed.

Several other species of mangoes are cultivated For instance, the horse mango (M. fætida), a native of Malacca, is cultivated in India, and M sylvatica, whose fruits are dried

and used like prunes

MANGO-BIRD. Several birds are called mango-birds in various parts of the world because they frequent mango-trees The East Indian one is an oriole (Oriolus kundoo); the West Indian one, so called in Jamaica, is a humming-bird (Lampornis violacauda), which may occasionally visit Florida.

MANGO-FISH, one of the threadfins a small perch-like sea-fish (Polynemus plebijus) which is numerous along Oriental coasts, and approaches the shore and is caught at the time when mangoes ripen. The same name is sometimes given to a relative in the West Indies (Polydactylus virginicus), called barbudo in the Cuban markets

MANGOSTEEN, a tree (Garcinia mangostana) of the family Guttiferæ, native of the East Indies, sometimes cultivated in tropical America It is one of the best-known fruits of the East Indies, and by many people is considered the finest fruit known. The fruits are about the size of a mandarin orange and of similar shape, with a thick, red-purple rind; the flesh is snow-white or cream-colored, so delicate that it melts in the mouth, and of delicious flavor. So far, attempts to grow the tree in Florida have been unsuccessful, and as the fruit does not bear shipping well it is little known outside the regions where it is grown.

MANGROVE, măn'grōv, a genus of trees and shrubs (Rhizophora) of the family Rhizophoracea The species, of which there are less than half a dozen, are all natives of the tropics, where they inhabit tidal marshes and the mouths of streams. They are remarkable for their aerial roots, which extend from the branches to the mud and then become trunks for the extension of the trees, which gradually advance even to low tidal mark; and also for their peculiar method of seed germination, the seeds sprouting while still attached to the twigs. The wood, which in some species is closegrained and durable, is used for fuel and to a small extent for other purposes; the bark, which is rich in tannic acid, is employed in tanning; the fruit of some species is edible and is used for wine making. The trees are important soil builders, their numerous roots serving to catch débris and by checking the current enhance the settling of mud from the water. Hundreds of acres of arable land have thus been formed in Florida. The best-known species is R. mangle.

MANGROVE HEN, a West Indian clapper-rail (Rallus longirostris), which seeks its food in the mangrove swamps

MANGROVE SNAPPER, the gray snapper, an excellent food-fish, which abounds among the mangroves along the coasts of Florida and the Bahamas, and thence to Brazil. See SNAPPER

MANGUANGAS, man-gwan'gas, a collective name for a number of heathen tribes living in the forests of the island of Mindanao, Philippines They are of the Malay race. See Philippine Islands

MANGUIANES, man-gē-anz', the natives of the interior of Mindoro, Romblon and Tablas (qqv), Philippines, they are divided into four branches, one of which is of Negrito blood, another is Mongoloid and the other two are of the Malayan race. There are several tribes, including the Bangot, the Buquil, etc. The term is also used in the island of Palawan to designate all wild natives of unknown origin. See Philippine Islands.

MANGUM, măng'gũm, Willie Person, American legislator. b. Orange County, N. C., 1792; d Red Mountain, N C, 14 Sept 1861 He was graduated from the University of North Carolina in 1815, was admitted to the bar in 1817, in 1818 was a member from Orange County of the lower house of the State legislature and in 1819 became a judge of the Superior Court. From 1 Dec. 1823 to 18 March 1826 he was a Whig representative in the 18th and 19th Congresses; but this post he resigned, and again he was elected a judge of the Superior Court. He retired from the court in 1826, but filled the office a third time in 1828–30. He was a United States senator from 5 Dec 1831 to 1836, when he resigned, and from 9 Dec. 1840 to 3 March 1853; and in 1842–45 was president pro tempore of the Senate. Throughout nearly his entire term of service in Congress he was a leader of the Whigs; and in 1837 he received the 11 electoral votes from South Carolina for the Presidency of the United States

MANGUM, Okla, city and Greer County seat, alt. 1,600 feet, on the Rock Island and the Missouri, Kansas and Texas railroads, 150m. SW. of Oklahoma City. It processes cotton. It has commission government, with a city manager. Mangum was proclaimed a city of the first class in 1906, by Territorial Governor Frantz. The place was named for A. S. Mangum, who held a grant of land on the site. Pop. (1940) 4,193.

MANHATTAN, one of the boroughs comprising the city of New York. See New York City.

MANHATTAN, Kans., city and Riley County seat, alt. 1,012 feet, at the confluence of the Kansas and the Big Blue rivers, and on the Union Pacific and the Rock Island railroads, 51m. W. of Topeka. There is a muncipal airport. The city is a trading center and distribution point for a rich farming region, and has small local industries. It is a college town, the seat of Kansas State College of Agriculture and Applied Science (q.v.). There is a public library (Carnegie) and the college library. The city has commission government. Pop. (1930) 10,136; (1940) 11,659.

MANHATTAN COLLEGE, an institution in Manhattan borough of New York City directed by the Christian Brothers. It was opened originally (1849) as an academy for young men, under the name of the Academy of the Holy Name, but the constant increase of the student body and the consequent demand for higher branches of study forced the academy to adopt the college courses, which was done in 1853, the academy being then incorporated under the name of Manhattan College The courses lead to the degrees of BA, MA, BS. and CE. The resources of the college are derived from tuition only, there being no endowment. The institution now occupies its new campus on the Spuyten Duyvil Parkway It enrolls approximately about 1,000 men, values its plant at about \$2,750,000; has an income of approximately \$325,000.

MANHEIM, Pa, borough in Lancaster County, alt. 399 feet, on the Reading Railroad, 10m NW. of Lancaster. Government: mayor-council. Pop. (1940) 3,831.

MANI', mă-nē', the indigenous peanut of Cuba, Peru and Chile In Mexico and Central America it is called cacahuate (q.v.).

MANIA. See INSANITY.

MANICALAND, mä-nē'ka-lănd, South Africa, a former territory of southern Rhodesia, situated on the border of Portuguese East Africa, east of Mashonaland, between the parallels of 18° and 21° S, and the meridians of 30° 30' and 33° E It is now divided between Portuguese East Africa and Rhodesia Manica is now a small district of the Portuguese territory. See Rhodesia.

MANICHÆANS, man-i-ke'anz, the followers of Manes, Mani or Manichæus, as he is variously styled, a Gnostic teacher, whose opinions prevailed in western Asia and eastern Europe during the 4th and 5th centuries of our era. Manichæism is generally considered to be the Persian type of gnosis, as it is distinguished by Zoroastrian dualism, and other features of that system. Hebrew elements of religion and Buddhistic doctrines were also found in Manichæism, which appears to have been an electic jumble of wild fancies, among which the soberest and strongest dogmas of the Christian creed were sometimes seen to be embedded The Dualism of Manes was conceived of by him as manifested in two contiguous realms of light and darkness, good and evil. The king-dom of light included a heaven and an earth, the latter guarded by æons, or good spirits, and presided over by a spirit of goodness. From the kingdom of darkness sprang Satan and his evil angels. This confusion and mixture, in the universe, of light and darkness, originated before the creation of man, a creature of light and darkness combined in proportions varying in each individual. The human race is finally to be purged of darkness and sin. Jesus Christ was looked upon as dual in nature; there was Jesus who did not and could not suffer, Jesus impatibilis, a sort of phantom or immaterial personage, and Jesus patibilis, who suffered death upon the cross.

The practical side of Manichæism appears in the condemnation of marriage, or sexual indulgence of any sort, and the ascetic purification of hands, mouth or bosom, which kept the in-

itiated from eating animal food, contracting ceremonial defilement through the touch and indulging the flame of human passion in the There were two classes of disciples, the initiated, or perfecti, and the auditores, hearers, or novices Saint Augustine of Hippo was, for nine years before his conversion to Christianity, a Manichæan hearer These hearers lived a much less strict life than the perfecti, and consituted by far the majority of the Manichean sect. The clergy of this sect were organized after the model of the Christian ministry; their rite of baptism was performed with oil instead of water; they had also a eucharistic meal among their public ceremonies. The system spread rapidly through the Roman Empire and competed with Neo-Platonism in hostility to the Church Diocletian persecuted the Manichans, and under Justinian the profession of Manichæism was a capital crime. The system, however, flourished in Asia beyond the 10th century and has reappeared in some shape or other, and under different names at different times in subsequent periods of European history Consult Routh, 'Acta Disputationis Archelar' (1848); Eusebius, 'Ecclesiastical History', De Beausobre, 'Histoire critique du Manichéisme' (1734), and Harnack, 'History of Dogma' (1897).

MANIFEST, in law, a written instrument delivered by the captain of a ship to the customs officials setting forth in detail the goods shipped, the consignors, etc. If there are passengers on board, this must be stated, and if the ship is about to proceed to a foreign port, the coal or other fuel on board must be set forth.

MANIFESTO, in international law, a declaration publicly issued at the commencement of a war by a contending power to show the causes which justify such a measure. Manifestoes are in the form of public letters; they commence with a short address to the public in general, and are signed with the name of the person who issues them See International Law.

MANIFOLDS, Theory of. See Assemblages, General Theory of.

MANIGAULT, Arthur Middleton, American soldier: b Charleston, S. C., October 1824; d. 16 Aug. 1886 In 1846 he was elected first lieutenant of the Charleston company in the "Palmetto" regiment for the Mexican War, throughout which he served. In June 1861 he was elected colonel of the 10th regiment, South Carolina infantry, and in 1861-62 was in command of the 1st South Carolina military district From the early part of 1862 he served in the army of the West successively under Bragg, Johnston and Hood, in 1862 was placed in command of a brigade, and in 1863 made brigadier-general At Chickamauga he distinguished himself by his repeated assaults, and in the retreat before Sherman's invasion he did some vigorous fighting. His death was hastened by a wound received in the battle of Franklin, Tenn. (30 Nov 1864). Subsequent to the war he was elected by the Democrats adjutant-general of South Carolina, serving until his death.

MANIHOT. See CASSAVA.

MANILA, ma-nil'a, capital of the Commonwealth of the Philippines, and its largest city and chief port; on the island of Luzon, in lat 14° 58' 31" North; long. 120° 58' 8" East; on

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Manila Bay, at the mouth of the Pasig River; terminus of the Manila Railroad. The city has been called the «Pearl of the Orient» It lies west of a line drawn from Japan on the north to the middle of Australia on the south, with the Malay Archipelago between it and Australia, and the continental mainland of Asia, at Hong Kong, 700 miles to the northwest.

Transportation.—Manila, in normal times, is connected with ports in all parts of the world by steamship lines, freight and passenger; and has further connection with the United States by clipper air service, and with cities of Asia and Europe by airlines via Singapore and Hong Kong Manila Bay, with an area of 770 square miles and a shore line of 120 miles, is one of the best harbors in the Far East. The modern port area affords deep, wide channels, abundant anchorage space, modern piers and warehouses, with mechanical cargo-handling equipment, and all the facilities of a natural harbor with the best of engineering improvement.

Inter-island transportation is provided by boat and airlines; intra-island, by railroad and bus. The Manila Railroad Company operates the railroads, which are owned by the Philippine government. Within the city of Manila passenger carriage is by bus, trackless trolley, street car, taxicab—and native vehicles, horse drawn.

Industries and Trade.—Prominent among Manila's industrial establishments are sugar centrals, rope and cordage factories, cigarette and cigar factories, coconut desiccating plants, and coconut oil mills. Other factories in the city make shoes, soap, rattan furniture, mats, and fiber hats. There are a number of canneries, and many food packing companies have headquarters here. An important and characteristic industry is hand embroidery.

Manila is the islands' center of trade. To and from it, via the other Philippine ports, passes the bulk of the islands' exports and imports, as well as of domestic, inter-island trade. More and more in Manila the old household industries tend to become mechanized, and there is increasing call by small factories for

power service.

Descriptive.—The old city, the original Manıla, a medieval walled town known as Intramuros, lies on the south side, or left bank, of the Pasig River. Here, within the ancient walls, are narrow streets, and houses of old Spanish type; here too are old churches and convents. and the University of Santo Tomás This institution, founded by Dominican missionaries in 1605 and designated as a pontifical university in 1645, occupies a building that dates from 1611. Under the walls enclosing the old town were, in the era of Spanish rule, powder magazines and dungeons.

North of the river is the Binondo section. Just off the bridge is Plaza Moraga, from which runs a busy street called the Escolta; upon these the business section centers. Near by is Calle Rosario, with Chinese bazaars. Tondo, to the north, is a semislum district and is the city's most densely populated area On higher ground are residential neighborhoods, and Malacana are residented to the commoncañan, residence of the President of the commonwealth; formerly the governor general's palace.

South of the walled city is the Ermita section, and adjacent to it, along the bay shore, is the Luneta, a park from which leads Dewey Boulevard, lined with fine residences. Street

names collocate, piquantly, the native, Spanish, and American phases and aspects of the city's history. Taft Avenue, Plaza McKinley, Dewey Boulevard; and the Avenues Rizal, Isaac Peral, San Luis

Education and Culture.—Since 1901 education in the Philippines has developed extensively Where then Americans organized public school systems, Filipinos now administer them. Enrolment in the elementary schools of the islands is large. Many boys and girls go on to the high schools, many avail themselves of the excellent opportunities for vocational and professional training. In Manila there is an efficient and adequate public school system, organized and administered on American lines. Provision is made for adult education, and for the training of teachers, an office of adult education was opened in 1936. The percentage of illiteracy was placed at 807 in 1939; the average for the Commonwealth was 488.

Institutions of higher learning in Manila include the Philippine Women's University, the Far Eastern University, the Centro Escolar University; the National University the University of Manila, the government-operated University of the Philippines, and Santo Tomás, mentioned above under Descripting

mentioned above under Descriptive.

In Spanish times education and culture were guided principally by the Church. There was no newspaper published in Manila until 1822, and public schools were not authorized until 1863; now, in Manila, there is a demand for American magazines and books apparently far in excess of the requirements of the white residents and visitors, swift development of a native middle class, educated in the English language, is the explanation. Manila itself is the place of publication of a large number of periodicals printed in English, Spanish, or Tagalog dailies and weeklies, monthly magazines and quarterlies, in various fields—political, educational, agricultural, commercial, scientific, religious, and literary

Manila has excellent facilities for entertainment and recreation: theaters, parks and play-grounds, athletic fields, and many clubs. The Philippine Exposition, held annually, in February, combines sports, pageants, educational and

cultural exhibits.

Libraries, Museums, Memorials.—Manila has many fine libraries and museums. The Na-tional Philippine Library and the Philippine Museum have collections of the greatest value. The University of Santo Tomás maintains both a library and a museum. The Bureau of Science houses a reference library and collections of photographs and of Philippine flora and fauna. The aquarium, near one of the gates of the old wall, exhibits tanks containing specimens of marine life from Philippine waters. Another interesting seat of science is the observatory, founded by the Jesuit Fathers in 1865, now maintained with government co-operation, and operated by members of the society. It has gained worldwide recognition through its studies of earthquakes and typhoons. In the Luneta stands a statue of José Rizal (q.v.); a further memorial to him is the Rizal Stadium. In the old city hall (Ayuntamiento) is a statue of Juan Sebastian del Cano (q.v.), Spanish circumnavigator. In this building are kept valuable carvings and paintings, and archives containing documents of great antiquity.

Buildings.—The architecture of Manila 15 diversified. In the native section are filmsy structures, shacks thatched with mpa palm leaves. In the walled town are Spanish houses with barred windows, balcones overhanging the street, tiled roofs, and family shrines set mto the walls; there are ancient Catholic churches, and palaces built for the Spanish rulers. And in the modern city there are theaters and hotels of modern American pattern; the paradeness and slip houses and the public fine residences and club houses, and the public buildings, of which the government buildings and the post office are the most notable.

and the post office are the most notable.

Churches and Charities.—Manila's oldest churches are Catholic; the Roman Catholic Cathedral, in the walled city, was dedicated in 1581 The Church of St. Augustine, also in Intramuros, is still older. The Episcopal Cathedral of St. Mary and St. John (1907) is surrounded by a grove of palms, acacias, and flame trees. Among the many other places of worship are the Cathedral of Tondo: First Ropoter, First are the Cathedral of Tondo; First Baptist; First Church of Christ Scientist; Hongwanji (Japanese Buddhist); and the Methodist and Pres-

byterian missions.

The Philippine General Hospital and the Quezon Institute are important institutions; the latter specializes in tubercular cases. The Hospicio de San José, refuge for foundlings, stands on an island in the Pasig River. Other hospitals are St. Luke's (1907); Santiago, St. Paul's, and San Juan de Dios. Billid Prison is not only the largest but the best organized penal institution in the Far East, designed to rehabilitate its immates, to whom it gives traming in the trades.

ing in the trades.

History.—Fifty years after Magellan claimed the Philippines for Spain, that is to say in 1571, Spanish government was organized in the native city of Manila Building of the defensive wall and moat was begun in 1790. In the 18th century the city was attacked by the Dutch and by the British, in their wars with Spain; the British held it from October 1762, to February 1763. From 1763 to 1898 it was held by the Spaniards; in 1896 a Filipino insurrection broke out, but failed to capture the capital. After the smashing of the Spanish fleet by Dewey in the Battle of Manila Bay (see UNITED STATES—War with Spain), Manila surrendered (13 Aug 1898). During the ensuing Filipino insurrection against During the ensuing Filipino insurrection against American rule, led by Emilio Aguinaldo (qv.), an attempt was made to destroy the city. After a period of military government, administered from Manila, civil government was established, with headquarters in the city (1901); and when the commonwealth was inaugurated (15 Nov. 1935), Manila retained its established status in the Philippine regime. With the outbreak of war in Europe in 1939, the city's the outbreak of war in Europe in 1939, the city's standing as capital of a possession anticipating standing as capital of a possession anticipating severance added to its economic difficulties the problems of defense. When hostilities with Japan began on 7 Dec. 1941, the city found itself one of the three great bastions for the defense of the Far East—Hong Kong and Singapore being the other two. The city was repeatedly hombed in the early weeks of the war

Singapore peing the other two. The city was repeatedly bombed in the early weeks of the war. Government.—Manila is the seat of the commonwealth government. The city government is headed by a mayor, and the municipal legislative body is the council. The commonwealth pays a percentage of the cost of the city's government; the remainder is raised by

city taxation. Manila was incorporated as a city ın 1901

Population.—The 1939 census of the Philippines showed that Manula had a population of 623,492. In 1936 the population, as of 1 July, was officially estimated as 355,485.

MANILA, University of, founded in 1585 by Philip II of Spain Later branches or affil-ated schools were founded in different parts of the island A seminary for the sons of Spanish nobles was opened in 1601, and 10 years later departments were added for the sons of those not belonging to the nobility and for the natives. The university was reorganized in 1857, and again after the American occupation. The departments are science, classics, law, medicine, theology, philosophy, engineering, pharmacy, arts and music. The usual degrees are granted. In 1926 there were about 1,000 students in attendance.

MANILA BAY, the largest bay in the Philippine Archipelago, indenting the western central coast of the island of Luzon Its greatest dimensions are from the minor bay of Pampanga in the northwest to Point Kalumpan on the south, about 38 miles; from the delta of the Grande de la Pampanga River southwest to Corregidor Island is 31 miles; circumference 120 miles. The entrance between Point Kalumpan and Corregidor is about seven miles in width; that between Corregidor and Mariveles about two miles. There are lighthouses on either side of the larger entrance. The bay is surrounded by five provinces, and receives the province of many provinces. waters of many rivers, including the Grande de la Pampanga, with its large delta, and the Pasig at Manila, which communicates with Laguna Bay, to the southeast, and has been dredged for navigation. The lands on both sides of the bay at the entrance are high and covered with vegetation, but the shores at the head of the bay are low and marshy, intersected by numerous small rivers, estuaries and tidal lakes. It is one of the finest harbors in the East, being free of obstructions to navigation, and affording excel-lent anchorage. But the water is so rough at times that it was necessary to construct large breakwaters to protect the shipping. Point Luzon is at the mouth. Submarine telegraphs are laid in the bay which run to San Francisco, to Hong Kong and to Iloilo. Manila, the capital of the archipelago, and Cavite, the United States naval headquarters in the Philippines, are on its shores; an artificial port is being constructed at Manila. In this bay Admiral Dewey won a victory over the Spanish fleet 1 May 1898.

MANILA BAY, Battle of. See United States—War With Spain.

MANILA HEMP, or ABACA, Musa tex-tilis. This species belongs to the plantam or banana family, the commercial fiber being derived from the stalk or trunk of the wild planrived from the stalk or trunk of the wild plantam of the Philippine Islands, and is classed as a structural fiber. The strongest and best of our hard cordage fibers, it is employed in the United States for standard binder twine and for all sizes of rope from the smallest dimensions to hawsers and cables. The old rope and the waste are employed as paper stock. The fiber is creamy white to reddish white, lustrous, easily separated, stiff and resistant, while its lightness makes it advantageous for employment in cordage for the rigging and running ropes of ships Structurally the bundles of fibres are very large, but easily separated into fibres of even diameter, the walls of the cells are of uniform thickness, growing slender to-ward the ends gradually and regularly. In breakage tests for textile strength, with English hemp - made by the British government -Manila stood a strain of 4,669 pounds against 3,885 pounds for hemp, ropes three and onequarter inches in circumference and two fathoms long being used in each test. In the Philippine Islands the finer grades of the fibre are extensively used for fabric manufacture, the product being worn by the natives of both sexes throughout the archipelago. Mixed with cotton a durable fabric is produced well adapted to the climatic conditions of the islands. According to a recent report of the Philippine Bureau of Agriculture, the manila hemp plant was introduced into India in 1859 and the Andaman Islands in 1873. The plant is also said to be found in Borneo and Java, and attempts have been made to introduce it into other countries. It remains a fact, however, that the commercial fibre is produced only in the Philippines The culture has been attempted without success in the West Indies, and seed was imported for trial in Florida only a few years ago; it was planted but it failed to germinate. Several species of banana yielding fair fibre are successfully cultivated throughout tropical and sub-tropical America, and in many other portions of the world. Banana fibre bears no comparison, however, with the Manila hemp of commerce, although the fibre of Musa basjos is produced commercially in Japan where it is employed for undergarments for summer wear, as well as for light dresses for the higher classes of Japanese.

Manila hemp first attracted attention commercially early in the last century, and was imported into Salem, and Boston, Mass., about 1824; samples of the fibre, however, were brought to this country by naval officers as early as 1820 The production of the textile had reached about 8,000 tons in 1840, 30,000 tons in 1860 and 50,000 tons in 1880. In 1900 the production was nearly 90,000 tons. It now averages about 100,000 tons. The United States took in 1930, 64,052 tons, valued at \$8,844,284 as compared with 72,190 tons, valued at \$13,496,000 imported in 1929. These figures relate to unmanufactured hemp only.

Regarding the specific localities of production and details of cultivation, preparation, etc, the student is referred to Bulletin of the Royal Gardens Kew (August 1894), to a Descriptive Catalogue of Useful Fibre Plants of the World (Washington 1897), and to the latest issues of the Farmer's Bulletin published by the Philippine Bureau of Agriculture, Manila.

The extraction of the fibre is a simple proposition. The abaca is cut near the roots when the plant is two to four years old, and just before blossoming; if cut earlier the fibre is finer but shorter. After striking off the leaves the trunk or stem is slit from end to end, and the sheathing layers of cellular matter, which form the petioles of the leaves, are separated, dried a day or two and then cut into strips three inches wide, and finally scraped until the fibre has been cleaned of all extraneous matters, soft cellular tissue, etc. The bundles of wet fibre are shaken

into filaments, washed, dried and sorted This is the export fibre for cordage purposes, the fabric fibre necessitating further treatment by beating, which softens and subdivides the filaments. The export fibre is wrought into hanks and made into bales of about 270 pounds, when it is ready for shipment Attempts to use machinery for extracting the fibre have not been successful, partly because the machines have not been adequate, and partly on account of native prejudice. There is a great waste by the hand methods of preparation which it is thought machine extension would obviate. See Fibre; Hemp; Jute; Ramie; Sisal Hemp.

MANIN, ma-nēn', Daniele, Italian patriot: b Venice, 13 May 1804; d. Paris, 22 Sept 1857. He studied at the University of Padua, was admitted to the doctorate of laws and practised at the bar. In politics he became the leader of the liberal class, and by 1847 had secured a solid reputation as a political economist. For anti-Austrian utterances made during that year and the next he was twice imprisoned, but while awaiting trial was set free by the populace upon arrival of news of the revolution of 1848 in Italy and France, was made President of the Republic of Saint Mark and given supreme power as head of the patriotic revolt. The Austrians were driven out, and during the siege which began in the autumn of 1848 and lasted 12 months, Manin was at the head of the civil government, and to his counsels and patriotic spirit it was mainly owing that the Venetians maintained so long and brilliant a defense After the capitulation Manin retired to Paris, where he maintained himself by giving lessons in Italian, and continued in various pamphlets and through the press to advocate the cause of Italian independence Consult Martin, 'Daniel Mamn and Venice in 1848-9'; Mortinengo, Cesaresco, 'Italian Characters' (1901).

MANIOC, or MANDIOC. See CASSAVA MANIPLE, (1) one of the divisions of the ancient Roman army. It consisted of 60 rank and file, two officers called centuriones and one standard-bearer called vexillarius. (2) In the Roman Catholic ritual a sacred vestment attached to the left arm, to leave the right at liberty for ministering. See COSTUME, ECCLESIASTICAL.

MANIPUR, măn-i-poor', northeast India, a thinly populated native state now more frequently called Assam State, which is confusing because there is Assam province (q v.). It consists principally of an extensive valley situated in the heart of the mountainous country which lies between Assam, Cachar, Burma and Chittagong; area, 8,456 square miles. The greater part of the state is covered with forest and jungle, and the wild animals include the elephant, rhinoceros, tiger, leopard, bear, deer and buffalo. The people belong to the Mongolian race, and are known as Manipuris. They are governed by a rajah, at whose court resides a Brutish political agent under the control of the chief commissioner of Assam. The capital is Manipur, also called Implial, lying in the Namkathay on Manipur River, which is tributary to the Irrawaddy, almost 250 miles north by west of Mandalay; pop. about 75,000. Most of the work is done by the Manipuri women, the men being lazy. The chief crop is rice. There is a special breed of ponies in the country, which are much

employed in the game of polo, the national sport of Manipur. There has been a political agent in Manipur since 1835. In 1891, in an outbreak headed by a member of the reigning family, the chief commissioner of Assam and the political agent were murdered; but the disturbance was soon put down and avenged Pop 446,000, composed chiefly of Hindus, Mohammedans, Christians and Buddhists Consult Johnstone, 'Experiences in Manipur' (1896).

MANIS, PANGOLIN, or SCALY ANT-EATER, an edentate mammal, belonging to the group Squamata, coextensive with which is the family Manide. The body and long, thick tail are covered with horny, imbricated scales. The legs are short and very strong, and the toes are armed with powerful claws, enabling the animals to burrow rapidly. These animals can roll themselves into a ball, and are then protected by their scales, and they exhibit remarkable strength in holding their bodies in this protective attitude. The scales are regarded as formed of agglutinated hairs; and in the Asiatic species true hairs grow between the scales and extend beyond them. All dwell in burrows, come abroad only at night and subsist almost altogether on ants and termites, which they capture by means of their long, rope-like, sticky tongues. They have no trace of teeth; and in general structure show a close resemblance to the American ant-eaters. They range in size from the African M. Gigantea, six feet, to two and one-half feet. They are comparatively common in some rocky districts of India and China. The latest review of the family shows that it contains seven species.

MANISTEE, man-is-tee', Mich., city and Manistee County seat, alt. 581 feet, on Lake Michigan at the mouth of the Manistee River, on the Pere Marquette and the Manistee and Northeastern railroads, and on state and federal highways; by rail, 147m. NW. of Saginaw. It has a natural harbor, which has been improved by extensive engineering works. The river by extensive engineering works flows through the city from Lake Manistee to Lake Michigan, and is navigable for vessels of moderate draft. A municipally owned and operated airport is three miles to the north, on a federal highway. The U. S. Coast Guard main-tains a Manistee station with three power boats. Products of the city's industries are salt, chemicals, paper, drop forgings, motor boats, furniture, clothing, highway markers, pumps, and a widely varied line of miscellaneous articles. Lumbering, formerly the foremost local industry, has been largely replaced by exploitation of salt and bromine deposits underlying the city. In its public and parochial schools Manistee has almost 2,000 pupils; its public library contains more than 30,000 volumes, and its parks total 50 acres. Orchard Beach State Park is two miles north of the city, on a bluff overlooking Lake Michigan. Eighteen denominations are represented in the city's churches. There is a modern hospital. Service and civic clubs, two music clubs, women's clubs and a country club contribute to the community's social and civic resources. Before the white men came, the Indians occupying the land about the site of the present city were Chippewas. White traders and missionaries of early times frequently camped hereabout. Father Marquette visited the locality It was in 1841 that the first permanent white

settlement was made In that year one John Stronach and his son Joseph set up a sawmil Here they found a strategic location for the lumber industry, as the river flowed through pine forests In Manistee Lake there was good storage space for logs, and they could easily be floated down the stream to the mills for cutting. It was in 1882 that the salt deposits were discovered Nineteen hundred feet underground is a stratum of salt rock 32 feet thick, and brine is pumped from a still lower depth, for use in manufacturing commercial salt. Manistee County was organized in 1855, and Manistee became a city in 1869. In 1861 the population was not more than 1,000; the Civil War and a disastrous fire retarded its development, but by 1869, the year of its incorporation as a city, the population had trebled. In 1871 the city was again almost destroyed by fire. A monument at the junction of state and federal highways marks a point on the old Chippewa Indian trail "Manistee" is an Indian word meaning "Spirit of the Woods" Commission government has been adopted by Manistee, and there is a city manager. The commissioners, elected by districts, one from each district, choose a mayor from their own number The water-supply system is municipally owned and operated, the water comes from wells. Pop. (1930) 8,078; (1940) 8,694.

MANISTIQUE, măn-ĭs-tek', Mich., city and Schoolcraft County seat, alt. 613 feet, on the north shore at the eastern end of Lake Michigan, at the mouth of the Manistique River; on the «Soo» and the Manistique and Lake Superior railroads, and on state and national highways, 107m. by rail SW. of Sault Sainte Marie. The Ann Arbor Railroad Company, in connection with its train service between Toledo and Manistique, operates a car ferry between Mar' tique and Frankfort, Mich The surrounding region has lumber and limestone. The city's manufactures and industries include paper, fitted lumber, wooden novelties, pulp-wood, and brooms. Manistique has a public library and a hospital; parks, playgrounds, and recreational centers. The public school system includes one high school Musical interests are conserved by a choral club, and the town has its quota of social, civic, and service organizations Manistique was incorporated as a city in 1901. The name is of Indian origin, meaning «Great Sandy Beach.» Administration of local government is under the supervision of a city manager. The water supply system is under municipal ownership; the water is taken from Indian River. Pop. (1930) 5 198: (1940) 5 399

ownership; the water is taken from Indian River. Pop. (1930) 5,198; (1940) 5,399

MANITOBA, man'i-tō'bä, Canada, occupies among the provinces of the Dominion a central position between t'e Atlantic and Pacific. It extends from the international boundary line on the south to the 60th parallel of north latitude on the north. It is bounded on the west by the province of Saskatchewan and on the east by Hudson Bay and the province of Ontario It thus lies between the 49th and 60th parallels of north latitude and the 89th and 102d meridians of west longitude. The maximum length of the province north and south, 760.65 miles, the maximum breadth east and west, 495 miles. The present area is computed at 246,572 square miles, of which 26,789 are water. Pop. (1870) 11,963; (1881) 62,260; (1891) 152,506; (1901) 255,211; (1911) 461,630;

(1931) 700,139. Winnipeg, the capital (qv), has an estimated population (1931) of 218,785; Brandon, 17,082; Saint Boniface, 16,305; Portage la Prairie, 6,597. Population by religious denomination: Presbyterian, 55,720, Anglican, 128,385, Roman Catholic, 189,693: United Church, 176,240; with the Greek Church, Lutheran, Mennonite, Jewish and Baptist (in the order named) in smaller numbers.

Boundaries.- The district of which the junction of the Red and Assiniboine rivers—now the city of Winnipeg—has always been the nucleus since the period of settlement began in 1812 has been subject to no fewer than six changes of boundary (a) The grant of Assiniboia made by the Hudson's Bay Company to Lord Selkirk in 1811 comprised 116,000 square miles from 52° 30' N latitude (passing through Lake Winnipeg) on the north to the "height of land" between the northern and Mississippi watersheds on the south and from Lake Winnipeg and the Winnipeg River system on the east to about 102° W longitude. The southern portion of this was found to be south of the international boundary after the Treaty of Ghent. (b) In 1841 the "Municipal District of Assimboia" was declared to extend "in all directions 50 miles from the forks of the Red River and the Assiniboine" (c) In 1870 at the transfer of the Hudson's Bay territories to Canada, the new province of Manitoba extended from the international boundary to 50° 30′ N. latitude and from 96° to 99° W. longitude From its limited area and shape it was long known as "the postage stamp province." (d) In 1877 the eastern and western boundaries were slightly changed from meridians of longitude in order to conform to the system of land surveys in township, etc (e) In 1881 the province was enlarged westward to the 30th range (nearly 101° 31′ W. longitude), northward to the 12th base line (nearly 53° N. latitude) and eastward almost to 95° W. longitude, though the way fixed only after extended litigation this was fixed only after extended litigation with Ontario in 1884 The area was now 73,732 square miles. (f) In 1912 the province was enlarged north and northeast to the present boundaries, including a littoral of 500 miles on Hudson Bay and about 178,000 square miles of new territory The northern boundary is now 60° N latitude and Hudson Bay and the northeastern boundary runs from the northeast angle of the old province to the eastern end of Island Lake, and thence to the shores of Hudson Bay at the 89th meridian of W. longitude.

Geographical Position and Climate.—The

Geographical Position and Climate.—The importance of this district has been determined throughout its history largely by geographical considerations. For the French fur-trade from Canada and for the British trade from the same source after 1763, the Winnipeg, Red and Saskatchewan river systems formed the links between the Great Lakes and the Athabaska fur districts Meanwhile from 1670, the date of the Hudson's Bay charter, to the transfer of the Hudson's Bay territories to Canada in 1870, the fur-trade by way of Hudson Bay came to follow the Hayes River route to Lake Winnipeg, thence the Red and Saskatchewan Rivers to the areas south and west The intersection of these two channels occasioned the long and bitter conflict between the Hudson's Bay and North-West companies. With American expansion up the Missouri and Mississippi rivers

a third channel of communication was opened up from Saint Paul—at first by "Red River cart" or river-boat down the Red River, and eventually by rail in 1878. With the completion of the Canadian Pacific Railway, traffic reverted to the Canadian route by rail or the Great Lakes It is seen therefore that the province lies at the headwaters of the three greatest waterways systems of the continent, the eastern by the Great Lakes and the Saint Lawrence, the southern by the Mississippi and the northern to Hudson Bay This strategic importance was the occasion of Schirk's choice of this district for colonization in 1811, for the movement in the United States during the sixties for the annexation of the Red River district to the American Union and for the more successful movement in Canada culminating in 1870 in the incorporation of the Hudson's Bay territories into the Canadian Confederation Recent developments tend to confirm these considerations. The resources of water power, the fertility of the prairie and the maritime outlet at Churchill on Hudson Bay almost from the centre of the continent (see Resources) tend to unite th interests of the factory, the prairie and the sea at a point where the distinctive interests of East and West begin to diverge On account of "its geographical position and its peculiar characteristics" Lord Dufferin in 1877 referred to the province of Manitoba as the "keystone of the arch" The position of Winnipeg (q.v.) as "the neck of the funnel" for traffic converging eastward and diverging westward has made that city the largest cash wheat market on the continent, with bank clearings normally equalled in Canada only by those of Montreal and Toronto.

The climate exhibits high variability of temperature, both daily and seasonal, together with a good average temperature for the year. The humidity, however, particularly in winter, is low. For the 20-year period, 1888-1907 at Winnipeg the mean daily range of temperature has varied from the maximum of 26 4° for May to the minimum of 181° for November. The mean annual range of temperature has been 68°, though the highest absolute range of temperature recorded has been 153°. The highest mean monthly temperature has been 77.6° in July, the lowest —13.4° in February. The annual rainfall has averaged 20.42 inches, but it is a remarkable fact that 10 9 inches of this have fallen during the four months May to August. The percentage of possible sunshine during the same period has averaged about 555 per cent — nearly double that of Edinburg. The growth of vegetation is thus remarkably rapid. The climate is healthful and invigorating, though the winters are severe and the changes from winter to summer and vice-versa are unusually sudden

Geology and Topography.— The geological formations encountered in Manitoba are Precambrian, Ordovician, Silurian, Devonian, Cretaceous, Pleistocene and Recent. Of these the early formations are found in ascending order from east to west, except that in the north-eastern angle of the province adjacent to Hudson Bay there is a belt of Silurian with another of Ordovician adjoining it. The Precambrian area, comprising practically the whole district east and southeast of Lake Winnipeg, extends roughly in a northwesterly direction, including

nearly the whole of the central and northwestnearly the whole of the central and northwestern part of the province. Outcroppings of Hurn n an and Keewarin are numerous (see Restants) though but limited areas have been as yet carefully prospected. The topography of this Archæan reason is very rugged with numerous lakes and wooded ridges of granites and gneisses largely denuted of soil by glacial action. The term "prairie province" long applied to Manitoba thus applies only to the southern and southwestern areas of the provincern southern and southwestern areas of the province, comprising less than two-fifths of the whole. The Ordovician, Silurian and Devonian belts, extending also in a general northwesterly and southeasterly direction, underlie the great lake districts of Lakes Winnipeg, Manitoba, Dauphin and Winnipegosis Valuable limestone, gypsum, shale and sandstone deposits outcrop at muny points over these areas (see Re-sources). The Cretaceous area directly overlying the Devonian in the southwestern district of the province exhibits soft shales and basal sandstone. The escarpment which forms the eastern edge of this area extends from the Pembina Mountains, near the international boundary, to the Pasquia Hills just south of the Saskatchewan River. The Pleistocene deposits of clay over the older formations, particularly in the south, are due, like the highly com-posite nature of the surface soils of this area, to the action of the great glacial lakes Agassiz, Souris and Saskatchewan - probably 110,000 square miles in area (Upham) of which considerably more than three-quarters lay within the present boundaries of the province original outlet of this great lake, the receding shores of which are marked by no fewer than 28 beaches (Upham), was toward the south until the melting of the ice-barriers opened up the natural outlet into Hudson Bay. To the rich composite deposits of surface soils during this process, particularly where the early recession of Lake Agassiz permitted adequate "weathering" of surface molds, the fertility of southern Manitoba may largely be attributed, though more recent alluvial deposits of both clay and humus are traceable in the Red River Valley. In the northern areas of the Lake Agassiz district the dramage is still very defective and the "weathering" of the soil correspondingly incomplete.

Perhaps the most striking topographical feature of the province is the surviving lake area of Lakes Winnipeg, Manitoba, Dauphin and Winnipegosis. Lake Winnipeg particularly (approximately 9,500 square miles) is the repository of the Winnipeg River system from the southeast, the Red and Assiniboine River systems from the south and the Saskatchewan River system together with the Winnipegosis, Manitoba and Dauphin Lakes system from the west. The outlet is by Nelson River into Hud-son Bay. The Churchill River flowing also into Hudson Bay drains a largely unexplored area in the northwestern part of the province. This variety of surface features is found with a very limited range of altitudes. The highest hills are found in the escarpments of the Cretaceous area—Pembina Mountains, Tiger Hills, Riding Mountain, Duck Mountain (2,600 feet) and the Pasquia Hills.

Fauna and Flora.—The wild life was at one time prolific and is still justly famous, though game is now carefully conserved. The

fur-trade was the first historic industry of the country. The buffalo, once found in almost incredible numbers on the prairie, is now extinct in its wild state, but the wapiti or elk, the antelope and the moose are still plentiful Among iur-bearing animals are the otter, beaver, mit k fisher, skunk, martin, muskrat, wolf ("timber" and "prairie"), bear, fox, lynx, ermine and wolverine, with the rabbit in great abundance as the basis of carnivorous life. Bird life is plentiful, including prairie chicken, wild duck mallard duck, wild goose and partridge among game birds, and more than 250 other species of wild birds. Among fish the whitefish, pickerel, pike, sturgeon, tullabee and goldeye have considerable commercial value

The flora of the province includes tamarac, spruce (white and black or "bog"), jack pine, trembling poplar and balsam fir over vast areas of the Precambrian district, with less plentiful growths of oak, elm, cottonwood and "Manitoba maple" an southern districts of the province. Small fruits such as strawberry, raspberry, blue-berry, cranberry ("high-bush" and "low-bush"), saskatoon berries, the wild plum, cherry and black currant are indigenous Wild flowering plants (more than 750 species of Phanerogamia) are remarkable during the summer months for

their profusion of variety and color.

History and Political Development.-Manitoba was admitted as a province to the Canadian Confederation only in 1870, but there is a sense an which the Hudson Bay district is the oldest continuously British territory upon the continent. The charter granted to the Hudson's Bay Company in 1670 formed the basis of the British claims which came to embrace practically the whole watershed into Hudson Bay. French counterclaims on behalf of Canada, however, were advanced and in many cases vindicated by force until 1713 when the district became British by the Treaty of Utrecht. Provision was made for a commission to determine the boundames between Canada and the Hudson's Bay territories, but no settlement was ever reached. After Canada also became British in 1763, traders from Montreal under the name of the North-West Company sought to revive the validity of the old French claims in order to vindicate their refusal to recognize the Hudson's Bay charter. This conflict in trade was accentuated rather than assuaged when the fifth Earl of Selkirk obtained control of the Hudson's Bay Company in 1811 in order to carry out his third project of colonization from the Scottish highlands The company granted him for the purpose the district of Assiniboia, comprising 116,000 square miles and controlling the most important strategic waterways of the west. The first band of settlers reached "the Forks" of the Red and Assiniboine rivers, the site of the city of Winnipeg, on 30 Aug. 1812. From the first, however, the North-West Company had determined to disperse or destroy the settlement, and faulty management on the part of the officials of the colony facilitated their purpose. In 1815, 134 of the settlers were induced to leave the Red River Settlement for Upper Canada. The rest were driven off to-ward Hudson Bay. Reinforcements re-estab-lished the colony in the autumn, but in the following spring Governor Semple and 20 of his men were killed at Seven Oaks, near the settle-

ment, by an armed band of "half-breeds" or Métis in the employ of the North-West Com-This act of violence at last aroused the pany British government from its policy of "salutary neglect," but Selkirk, who was on his way from Canada to the settlement when he received the news of Seven Oaks, made the fatal mistake of turning aside to retaliate upon the North-West partners at Fort William The rest of his life was filled with bootless litigation; for though he visited the settlement in 1817 and spent both health and fortune upon it, he died in 1820 without vindicating his cause Meanwhile the British government had brought pressure to bear in order to bury the blunders of the past by a coalition between the rival companies This was effected in 1821 under the name of the Hudson's Bay Company, and the old "Northwesters» became the staunchest exponents of all the rights of the charter.

The Red River Settlement, meanwhile, had suffered a series of natural as well as deliberate calamities. A plague of grasshoppers in 1818 and finally the great flood of 1826 threatened, as Governor Simpson wrote, to prove "an extinguisher to the hope of Red River ever retaining the name of a settlement." The colony was firmly re-established, however, by a succession of prolafic harvests and the profusion of natural resources for primitive settlement (Sheriff Ross records the slaughter of 2,500 buffalo in a single "hunt," and no fewer than 16,000 whitefish were taken by the settlers on their retreat after Seven Oaks). By 1830 the Red River Settlement bore every appearance of "peace and plenty" In 1834 it reverted by purchase from the Selkirk family, in whose possession at had remained after the fifth Earl of Selkirk's death, to the direct control of the Hud-

son's Bay Company.

After the coalition in 1821 the company's trade an Rupert's Land, as the "chartered" terntory came to be called, had responded rapidly to the enterprising management of Gov George Simpson. By license issued successively in 1821 and 1838, for periods of 21 years, the company was granted a monopoly of the furtrade for the whole district westward to the Pacific. A new Fort Garry with walls and bastions of stone was built at "the Forks" (1836-38) but the Red River Settlement remained for more than a generation a primitive and secluded community. The primitive "council" at the settlement gave place after 1834 to the regularly constituted "Council of Assiniboia." After 1841 the "Municipal District of Assiniboia." After 1841 the "Municipal District of Assiniboia" came to include only the area within a radius of 50 miles from "the Forks" of the Red River and the Assiniboine. Colonization was overshadowed by the opulence and mystery of the fur-trade, and though the company can scarcely be charged with neglect, Selkirk's original plan of affording a stable and ready market for agricultural produce in the expanding trade of the company was only partially realized. With the advent of the American trader from the south and the enterprise of the "free-traders" within the settlement itself, even the company's cherished monopoly of the fur-trade was subject to challenge

subject to challenge
The original Scottish settlers, reinforced by
many of the retiring servants of the company,
formed a thrifty and contented community.
The French Métis, however, though served by

a devoted Roman Catholic priesthood, formed a much less stable element of the population. Accustomed to live by the buffalo chase or by fishing, they were readily susceptible to influences with which the primitive patriarchal authority of the company soon proved powerless to cope. The process of "smoothing" the malcontents by adroit management postponed the conflict without averting it. In 1849 the primitive judiciary at the settlement was openly intimidated into acquitting one of the "freetraders" in furs. Thereafter the monopoly of the fur-trade was openly contravened. The Red River Settlement began to attract attention in Canada and in the United States. In 1857 the Committee of the British House of Commons drew up its famous 'Report' on the Hudson's Bay Company, and it became apparent that Canada had the ear of the British government in the dream of expansion to the Pacific.

From 1857 to the transfer of the Hudson's Bay territories to Canada in 1870, the develop-ment of the Red River Settlement was rapid and at times turbulent. During 1856 no fewer than 500 Red River carts with produce and furs plied to the American outposts. Three years later two Canadian journalists brought in a printing-press, and the Nor-Wester advocated insistently a union with Canada. American opinion was scarcely less pronounced; as late as 1869 Governor McTavish of the Hudson's Bay Company regarded annexation to the United States as the "manifest destiny" of the Red River district. The Canadian party, however, though enterprising and aggressive, bitterly antagonized the company and many of the older inhabitants. The improvident and credulous French Métis, particularly, were suspicious and resentful. Generous "reserves" of land and scrupulous tact on the part of Canadian officials might have allayed their fears of the impending change. In 1869 the purchase of the Hudson's Bay territories by Canada for £300,000 (\$1,500-000) was arranged under the auspices of the British government. The company had changed hands in 1863, and the resident officials in Rupert's Land could not be expected to be enthustastic either to the new directorate or to Canada. The Scottish settlers readily acquiesced in the change, but the fears of the French Métis were fomented by a few agitators into open in-

surrection against the transfer.

The Dominion of Canada had been formed only in 1867, and the Riel Insurrection at Red River reflected largely the attitude of Quebec in the Canadan Confederation. The establishment of a smaller Quebec on the banks of the Red River had long been the policy of the French clergy. The prospect of union with Canada without guarantees for their race, language and religious control over the Métis occasioned the bitterest resentment. During Archbishop's Tache's absence from Red River a rising of Métis led by Louis Riel received the support and for a time submitted largely to the guidance of French clerical influence in touch with Canadian politics Riel seized Fort Garry and dominated the settlement for 10 months until the arrival of a military expedition under Colonel Wolseley on 24 Aug. 1870. "Land scrip" was issued for the Métis, and clauses intended to safeguard the French language and separate schools found their way into the Manitoba Act by which the province was formally

interpret 1 into the Derivier; but the violation of the land has a made rates, and particularly of the land has a made rates, and particularly of the land has a few along an interpret policy of the respective of the result of the second on loose the free for the land the second on loose the relation of the first result of the second on them during the Rel Insured on The total requirement of the first result of a legislative assembly of 24 members (with an executive council of the first results) with an executive council of the first results with an executive council of the first results. The may produce interpret from the first a series of problems which kept public feeling at high tension. Cross-currents of race and religion—a Fennan raid in 1871, the "annuast, question" and the trial of Lepine for the death of Scatt—complicated for many years the work of provincial government. The chronic feverty, moreover, of the "gostage stamp province" reduced administration after alministration to a degree of economy bordering upon province in provincial regists" became interestingly insistent with the of economy bordering train parsimony. The agitation for "better terms" and "provincial rights" became increasingly insistent with the responsibilities attendant upon rapid immigration. Within a decade the population grew from 12,000 to 60,000. The railway from Saint Paul was completed in 1878, with the Canadian Pacific Railway in prospect east and west the province began in 1879 to experience a 'boom' which added \$5,000,000 in buildings and doubled the population of Winnings within a special resp. the population of Winnipeg within a single year After 1882 the return to normal conditions was slow and difficult. Under the Norquay administration particularly (1878-87) the provincial government was found to be struggling against intolerable disabilities. The control of natural resources had been retained by the federal government. The provincial treasury was dependernment. The provincial treasury was dependent chiefly upon meager grants from the Dominion under the form of direct allowance for government, per capita allowance for mestutions, "debt allowance" for Dominion indebtedness in 1870, subsidy in lieu of public lands, etc. The national importance of the Canadian Pacific Railway was held to justify "a monopoly clause" against the granting of provincial charters to competing railways. The grant of one-twentieth of settled land to the Hudson Bay Company by the terms of the transfer in 1869 and the generous grants of land to the Canadian Pacific Railroad had created a "land-lock" Pacific Railroad had created a "land-lock" which interfered seriously with settlement. An increase of federal subsidy to \$227,000 in 1882 and the extension of the houndaries proved quite inadequate concessions. The Canadian Pacific Rainroad was completed in 1885 but the province proceeded to contest the "monopoly clause" by undertaking the Red River Valley Railway as a government work. The new Greenway administration (1888-99) forced the Dominion at last to repeal the absorbable Greenway administration (1888-19) forced the Dominion at last to repeal the objectionable "monopoly clause." This first substantial victory for "provincial rights" was regarded as "the advent of a new era."

"The Manitoba School Question" which dominated provincial politics and eventually even federal politics in 1896 is dealt with elsewhere. The Roblin administration, from 1900, was marked by few fundamental political issue.

was marked by few fundamental political issues.

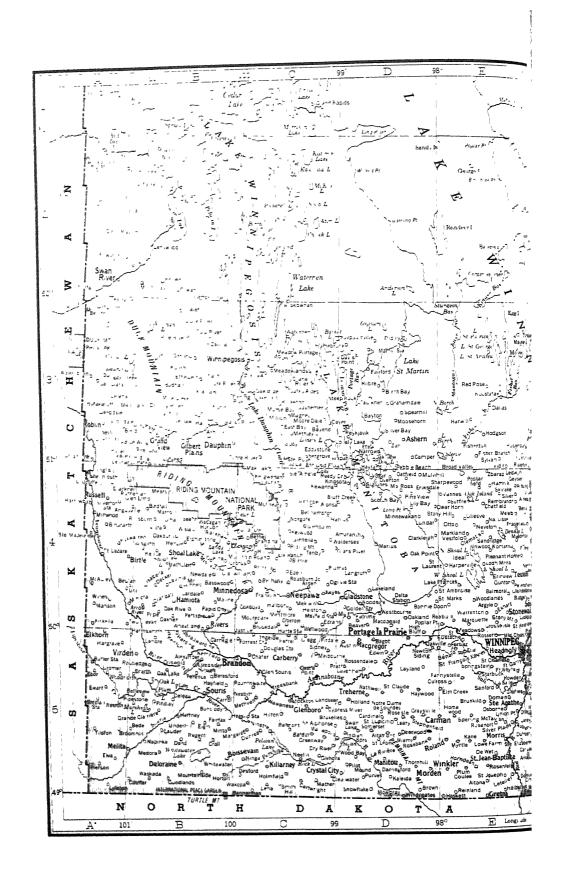
In 1908 the government announced "the first complete system of government-owned tel-phones on the continent." Four years later it was announced that there were nearly 4,000 was announced that there were nearly 4,000 miles of completed railway lines within the province, of which about 1,600 miles had been to it in seven years. Provincial guarantees of railway bonds (\$25,000,000) have since been practically abrogated by the Dominion in taking over the Canadian Northern Railway. In 1912, almost exactly a century after the beginning of settlement in Assimboia, the boundaries of the province were extended northward over a new district estimated at 106,304,000 acres, with a littoral of 500 miles on Hudson lay (see Boundaries). The sum of \$2,178,648 was granted for arrears of claims by the province granted for arrears of claims by the province, and the total federal subsidies were increased from less than \$840,000 in 1911 to nearly \$1,350,on less that \$34,000 in 1911 to hearly \$1,301,000 pending the control of the natural resources by the province. The Norns administration which was strongly supported at the polls after the resignation of the Roblin government in 1015 carried forward a very comprehensive policy of education. The Hudson Bay Railway for which \$33,448,655 had been expended by the learning on the 1036 is now in coercitor from Dominion up to 1936 is now in operation from The Pas to Port Nelson—51007 miles, but is incurring large deficits. For the province of Manitoba, the prospect of a shorter water route to the British market, for at least four months of the year, than that from New York, marks a curious recurrence to historic conditions. Not less important will be the prospect of opening up-eventually under provincial control-the natural resources of the vast northern areas of the province The chief interests of Manitoba, however, remain agricultural. By far the most remarkable development of recent years in western Canada has been agrarian organization-the Manitoba Grain Growers' Association with similar organizations in other western provincesliar organizations in other western provinces— for co-operative and educational purposes. The United Grain Growers, Limited (an analogous commercial organization formed in 1917 by the union of the Grain Growers' Grain Company and the Alberta Co-operative Elevator Com-pany), with headquarters in Winnipeg, has achieved by far the most signal success in Can-ada. In 1926 the Manitoba Co-operative League was organized to link together the societies of the province.

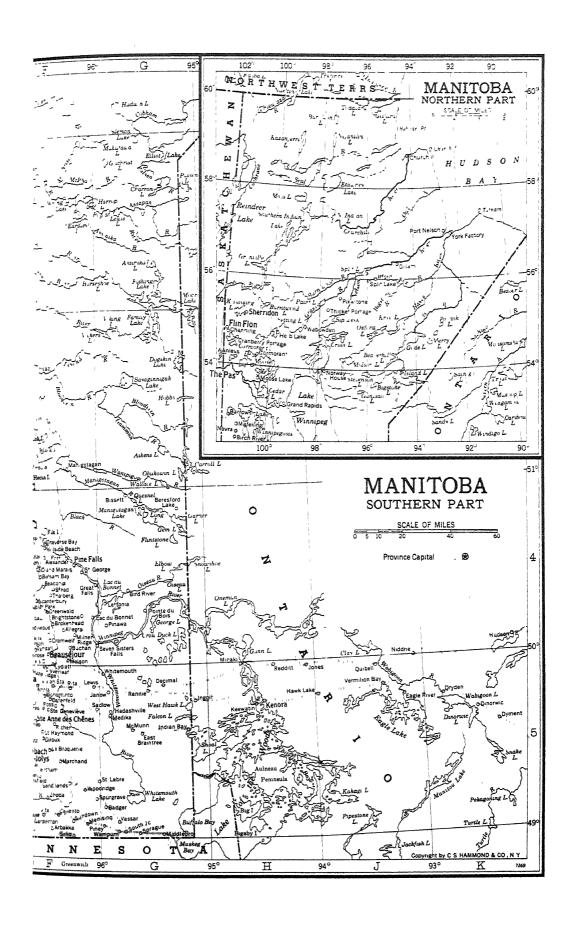
Natural Resources, Manufactures and Transportation.—The following official statistics will indicate the relative returns from natural resources (as tabulated for 1936 in the Canada Y car Book), the estimated value of

manufactures, etc.

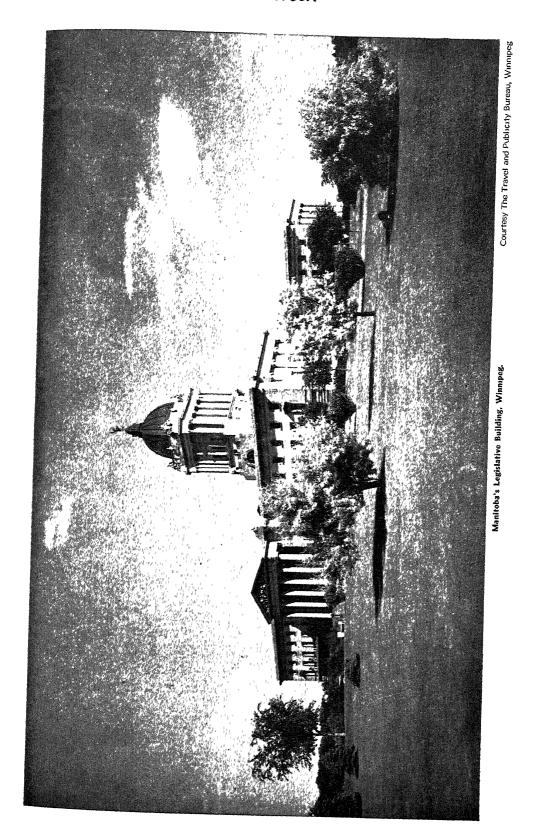
In 1936 agriculture made the largest proportionate contribution to the net value of production in Manitoba. Agriculture led at 39.76 per cent or \$48,858,000 with manufactures second at 31.58 per cent or \$38,804,000. Third position in Manitoba in 1936 was held by mining at 7.62 per cent or \$9,366,000. The gross value of agricultural production in the province was, however, much greater than the above figure would indicate. Field crops had a value of \$50,660,000 in 1936; farm animals produced a total of \$9,068,000; wool was valued at \$132,000. 000; dairy products were valued at \$11,631,000; fruits and vegetables had a value of \$827,000: poultry and eggs a value of \$3,629,000; fur

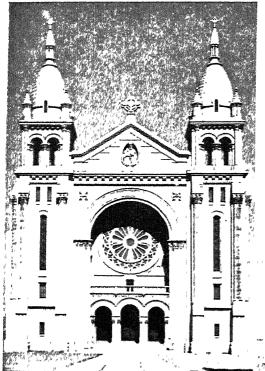
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	404	Broomhill, (B5)		Duck River (B3)		Grande Pointe (E5)		Jarcolas (F4)	
31 - TULT, B51	101	Brown (D5)		Dufresne (F5)		Grand Marais (F4)		Justice, (C4)	48
	109	Brunkild, (E5)	64	Dufrost, (E5)	110	Grand Rapids (H3)		Kaluida, (D5)	
						Carad Vivia D2	606		
or no D5	218	Bruxelles, (C5)	131	Dunrea, (C5)	220	Grand View, B3.	696	Kane, /E5,	
7 ns D5	345	Buchan, (F4)		Durhan, (A3)	198	Grass River 1D4		Katrime_(D4)	
7	114	Bunclody, (B5)		East Bay (C3)		Graysville, (D5)	100	Kelloe, (B4,	42
aranch D4		Butler Station, (A5)		East Braintrec, (G5)		Great Halls, (F4)	108	Kelwood (C4)	211
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71 Fag 155-4		Comp Morton (Ed.		Edrans, (C4)	100	Grugg, (B5)	29	Kerwenan (C4)	
-1a F5: -1a F5:	290	Camp Morton, (F4)	021	Colors, (C4)	100	Great, Day		Inc. wellall (CA)	
1 54 1 ES		Carherry (C5)	931	Edwin, (D5)		Gretna (E5)	507	Kewanna (C4)	
i i Es	159	Cardale (B4)	81	Ekhart, (E4)		Griswold (B5)	285	Keves, (C4)	40
ا E5 الساد -	23	Cardinal, (D5)	103	Elgin, (B5)	344	Grosse Isle (E4)	44	Killarnes (C5)	1,051
n. 14	106	Carey, (E5)	50	Elie (E5)	126	Grunthal (F5)	150	Kirchota (C4)	-,
, R sur (B4)		Cares, (LS)	50	Ell barre (A5)				Fral along 13.43	
-L-n , D31	342	Carlowne, (E5)		Elkhorn (A5)	557	Gunton, (£4)	163	Kirkelia, (34)	55
⊬. [c, (B3)	15	Carman (D5)	1,455	Elk Ranch (C4)		Guinimir, C31		Kleefeld, (F5)	
EE	380	Carnegie, (B5)		Elm Creek (E5)	378	Gypsumville, D31	166	Komarno, (E4)	129
- 471 E5	276	Carroll, (B5)	92	Elm Grove, (F5)		Hadashville (G5)		Koostatak (E3)	
. t r. (D5)	210				89		13	brain b D2	
15 5 (4.3)		Cartwright, (C5)	412	Elva (A5)		Halhstadt, (E5)	12	Kulish B3	
, D5	105	Castle Point, (C5)		Emerson, (E5)	854	Halicz (B3)		La Broquerie (F5)	150
Cir Cir	500	Cayer, (D3)		Endcliffe (A4)		Hallburo, (C4)		Lac du Bonnet (G4)	560
- La Car	208	Channing, (H3)		Eriksdale, (D4)	305	Hamiota, B41	524	Ladywood, (F4)	33
-1-a 1E41	200		35		000	Hamrlik (E4)		Lake Frances (E4)	00
am Bav (F4)		Chater (C5)		Erinview (E4)	256				
rneman (C5)	111	Chatfield (E4)	130	Ethelbert, (B3)	356	Harcus, (D4)		Landseer, (C5)	
- HUJ F5		Chortitz, (F5)	115	Ewart, (A5)		Harding, (B5)	63	Langruth, (D4)	224
* 11 LUL 11 12 1		Churchill, (K2)	330	Fairfax, (B5)	59	Hargrave, (A5)	55	La Riviere, (D5)	275
eri a. (H3)	440	Claridation, (172)			27	Harlington (A2)	•••	La Rochelle, F51	2,0
(B4) لعديد	148	Clandeboye, (E4)	120	Fairford (D3)					
.rd, <u>C</u> 3)		Clanwilliam, (C4)	180	Fannystelle (E5)	161	Harmsworth, (B5)		La Salle (E5)	78
1, 10%		Clarkleigh, (D4)		Faulkner, (D3)		Harperville, (E4)		Lauder, (B5)	167
f n (D3)		Clearwater, (D5)	222	Findlay, (B5)	17	Harrowby, A41	40	Laurier, (C4)	171
a. ria. (F4)		Clear water (E4)		Firdale, (C5)	-	Harte Station, (C4)		Lavenham (D5)	
casen ur. (F4)	1,161	Clematis, (E4)		Fildale, (C3)	400		170		
aver D4)		Cloverleaf, (F5)_		Fisher Branch (E3)	400	Hartney, (B5)	478	Lavinia, (B4)	
de B5		Cook s Creek, (F4)		Fisherton, (E3)		Harwill (E3)		Layland, (D5)	
LE DO		Cordova, (C4)		Fishing River (B3).		Haskett, (E5)	61	Leary, (D5)	
dir 'F4!		Cormorant (H3)		Flin Flon (H3)	5,555	Hayfield, (B5)	70	Ledwyn, (E4)	
Pries, 1B5/		Cornoratic (115)	60		,,000	Hayland, (D3)		Lena (C5)	
grampton, (C4)		Coulter, (B5)	00	Foley, (E4) Fork River, (B3)	103		100		
14 - Par 1 (\$ 24)		Cowan, (B2)		Fork River, (B3)_	182	Haywood, (D5)	100	Lennard, (A3)	
mi ne, (C5)	300	Cracknell, (A4)		Forrest Station,(C5)	50	Hazelridge (F5)	83	Lenore, (B5)	145
The fact Cost	000	Cranberry Portage,		Fort Alexander, (F4)		Headingly, (E5)	500	Lenswood, (B2)	
nard, (E5)	004		321	Fort Garry, (E5)	3,458	Heaslip Station, (C5)		Letellier, (E5)	225
nito, A3) rens River (F2)	294	(H3)			,,450			Letterner, (La)	220
rens River (F2)		Crandall, (B4)	237	Fortier, (E5)	=00	Hecla, (F3)		Lettonia (G4, Lewis, (F5)	
restord (B5)	69	Crane River, (C3)		Fort Whyte, (E5)	700	Helston (C4)		Lewis, (F5)	
restord Lake, (G4,		Crocus, (C4)		Forwarren, (A4)	219	Herb Lake, (H3)		Lihau, (F4)	149
	,	Croll, (B5)		Franklin, (C4)	160	High Bluff, (D4)	125	Lillesve, (E4)	
E41		Croii, (D3)	96		113	Hilbre, (D3)		Lily Bay, (D4)	
"rany (C4) .	113	Cromer, (A5)	90	Fraserwood, (E4)		Tilling, (D3)		Land Day (D4)	
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ulah, (44)	61	Crystal City, (C5)	475	Garland, (B3)		Hilltop, (C4)		Loch Monar, (E4)	
eid (43) .		Culross, (D5)		Garson Quarry, (F4)	240	Hilton, (C5)		Lockport, (E4)	110
	276	Curross Burer (DE)	313	Genthon (F5)		Hnausa, (F4)		Lonely Lake, (D3)	
riscarth (A4)	376	Cypress River, (D5)	313	Gention (13)			150	Lorette, (F5)	
ruh Bay. (D3)		Dallas, (E3)		Geyser, (E4)	004	Hodgson, (E3)			540
rer River (H3)	200	Dand, (B5)		Gilbert Plains, (B3)	804	Holland, (D5)	388	Lundar, (D4)	540
rd River, (G4)		Darlingtord, (D5)	207	Gillam, <u>(</u> K2)	85	Holmfield, (C5)	166	Lydiatt, (F5)	65
		Dauphin, (B3)_	4,662	Gimli, (F_4)	853	Homebrook, (C3)		Lyleton, (A5)	134
rdtail, (B4)	0.0		1,002	Giroux, (F5)	106	Homewood, (E5)	75	McAuley, (A4)	139
rr e, (C4,	98	Davis Point, (D3)		Chadasan (D4)					57
rtle (B4)	646	Decimal, (G5)		Gladstone, (D4)	669	Horod, (B4)		McConnell, (B4)	100
sett (G4)	525	Decker, (B4)	104	Glenboro, (C5)	571	Horseshoe Bay		McCreary, (C4)	400
he Wing, (A3)		Deepdale, (A3)	70	Glencairn, (C4)		(Whytecliff),(K3)		Macdonald, (D4)	54 520
(D4)				Glenella, (C4)	190	Horton, (B5)		Macgregor, (D5)	520
uti Creek, (D4)		Deer Horn, (E4)		Clan Elmo (B4)		Howden, (E5)		McMunn, (G5)	
xihan, (B3)		Deerwood, (D5)		Glen Elmo, (B4) Glenhope, (C3)				MacRoss (D4)	
ggy Creek, (A3)		Deloraine, (B5)	773	Giennope, (Co)		Husavick, (F4)		MacRoss, (D4)	27
issevain, (C5)	817	Delta Station, (D4)		Glenlea, (کیا5)		Ideal, (E4)		McTavish, (E5)	27
nnie Doon, (D4)		Desford, (C5)		Glenora, (C5)	32	Ile de Chenes, (F5).		Mafeking (H3) Magnet, (C3)	108
		De Wet (F5)		Glen Souris, (C5)		Hford (12)	67	Magnet. (C3)	62
wsman River,		De Wet, (E5)	10	Colden Street /D4		llford, (J2) Indian Bay, (G5)	٠.	Makaroff, (A3)	23
12)	160	Domain, (E5)	49	Golden Stream, (D4)		Indian Day, (US)		Malund (C4)	124
auwardine, (B5)	88	Dominion City, (E5)	277	Gonor, (F4)		Indian Springs, (D5)		Makınak, (C4)	124
	4	Douglas Station,		Goodlands, (B5)	115	Ingelow, (C5)		Malonton, (E4)	51
andon. (C5).	17.383		175	Grahamdale, (D3)		Inglis, (A4)	205	Manigotagan, (F3)	
	17,383	(C5)							
ightstone, (F4)		(C5)	1/5			Inwood, (E4)	84	Manitou, (D5)	665
ightstone, (F4) uad Valley, (E3)	265	(C5) Drifting River, (B3)		Grand Beach, (F4)		Inwood, (E4)	84 153	Manitou, (D5) Manson, (A4)	
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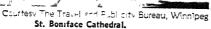




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	Pulp River, Bil.			110			
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National Modern (12)	Rackham, 184		St Lapitum (DS).		Sundown (F5)		Wisla, (B4)
	Ranid (Ity B4)		St Malo F51	45	Swan Lake. (D5)		Wood Bay, DS
	Rathwell D5	223			Swari River, (A2)	1,129	Woudlands, (E4)
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Nettly Lake, (F4)	Reedy Creek (C4)		St Norhert (F5)	383	Terence, (B5)		Woodside (D4),
Nestin (C4)	Ragent, (B5)	40	St Pierre-Julys, F51	820	Teulon, (E4)		York Factory, (K2)
	Reinland (E5)	***	St Raymond, (F5)	040	Thalberg (F4).	510	Zalicia, (B3)
Newton Ending (D5)	Rembranut, (E4)	26	Saltel (F5)				
	Rentije, (G5)	95			The Narrows, (D3)	2 101	Zant, (D3)
		73			The Pas (H3)	3,181	
Niverville (5) 13		ATO	Sandilands, (F5)		Thicket Portage, U3		Zelena, (A3)
Norgate, (C4)	Kestun (A5) .	*20	Sandridge, (E4)		Thornhill, (D5)	102	Zhoda, (F5)









Boating on Clear Lake in Riding Mountain National Park.



Four hundred miles north of the International Boundary, the \$50,000,000 mining plant of the Hudson Bay Mining and Smelting Company produces copper, zinc, gold, silver and cadmium, and supports a vigorous town of 8,000 people.

farming a value of \$467,000; and honey, \$569,000. This gives a total of \$77,066,000. The same year the current value of farm capital in the province was given as follows. Land and buildings, \$224,848,000, implements and machinery, \$40,137,000, live stock, \$45,885,000, a total of \$310,870,000. The acreage, yield and values of the principal field crops in 1937 was as follows: Spring wheat, 2,872,000 acres; 48,000,000 bushels valued at \$46,550,000; oats, 1,410,000 acres, 43,075,000 bushels valued at \$16,799,000, barley, 1,393,000 acres, 34,800,000 bushels, valued at \$16,356,000; all rye, 135,200 acres, 2,460,000 bushels valued at \$1,796,000; peas, 2,600 acres, 44,000 bushels valued at \$66,000; buckwheat, 5,800 acres, 103,000 bushels valued at \$85,000, mixed grains, 23,800 acres, 626,000 bushels valued at \$275,000, flaxseed, 38,300 acres, 370,000 bushels valued at \$559,000; potatoes, 30,900 acres, 2,481,000 hundredweights valued at \$1,687,000; turnips, 5,500 acres, 723,000 hundredweights valued at \$376,000; hay and clover, 410,000 acres, 788,000 tons valued at \$4,444,000, alfalfa, 30,000 acres, 71,000 tons valued at \$552,000; fodder corn, 64,500 acres, 275,000 tons valued at \$1,375,000. The estimated area under pasture in 1937 was 245,000 acres. In the same year, 270,471 acres of provincial lands were under grazing leases. The numbers and values of farm live stock in the province in 1937 were as follows. Horses, farming a value of \$467,000; and honey, \$569,-000. This gives a total of \$77,066,000. The vincial lands were under grazing leases. The numbers and values of farm live stock in the province in 1937 were as follows: Horses, 324,700 valued at \$20,781,000, milch cows, 390,400 valued at \$12,493,000; other cattle, 456,600 valued at \$10,958,000; sheep, 216,200 valued at \$1,096,000; swine, 228,900 valued at \$2,747,000, making a total value of \$48,075,000. There were in addition 4.333.000 head of poultry valued at making a total value of \$48,075,000. There were in addition 4,333,000 head of poultry valued at \$3,064,000. The mineral production of 1937 had a value of \$16,055,743. Copper production has increased in late years, the 1936 output being 29,853,220 pounds valued at \$2,829,190 In the same year the province produced 139,273 fine ounces of gold valued at \$2,879,028; 791,489 fine ounces of silver valued at \$357,175, and 36,744,951 pounds of zinc valued at \$1,218,095. The province reported 1,011 manufacturing es-36,744,951 pounds of zinc valued at \$1,218,095. The province reported 1,011 manufacturing establishments in 1936, capitalized at \$118,515,841, with 22,507 wage earners, paying \$24,490,299 in wages, \$74,374,078 for materials and producing goods with an aggregate value of \$122,050,502. The leading industries are: slaughtering and meat-packing, railway rolling stock, butter and cheese, flour and feed, central electric stations, printing and publishing, bread and other bakery products. malt and malt products. bags, cotton products, malt and malt products, bags, cotton and jute, clothing, men's furnishings, etc.

Government and Judiciary.—The provincial government consists of a legislative assembly of 55 members with an executive council of seven members directly responsible to the legislature. A lieutenant-governor is appointed by the Dominion for a term of five years. The legislature for which both men and women are eligible is elected for a period of five years unless dissolved in conformity with principles of British parliamentary procedure. The province has a representation of 17 members in the Dominion House of Commons, based pro rata, like that of other Canadian provinces, upon the fixed number of 65 from the province of Quebec.

The judiciary comprises (a) the Court of King's Bench, consisting of a chief justice and five puisne judges with original civil and criminal jurisdiction, and until 1906 with jurisdiction.

tion also, when sitting en banc, as the ultin court of appeal. (a) In 10% a Court of peals was established, consisting of a court guidece and four (originally three) purisdees with appellate jurisdeether from of courts of the province (c) County Court in the various judicial districts of the provin with jurisdeether over certain civil (in generate the province of \$50%) and criminal cases. (d) Surgate Courts, one in each judicial district of province. The County Court judge is officio judge of the Surrogate Court, with jurisdeether over administrations and probability supendiary magistrates and justices of peace.

Education.— Manitoba possesses, under control of a Minister of Education, assisted an Advisory Council, a comprehensive syst of non-sectarian public education from primary school to the provincial universimcluding among other progressive feature compulsory education, consolidated school residences for teachers in outlying districts the province Education is, however, really cally controlled, as it is in all of the ott provinces, and is supported by local taxation a by government grants. In 1937 there were 4,4 teachers and 142,482 pupils in the 4,290 published schools, having one room for high schools; 17 collegiate departments; and 27 collegiate institut. The province has a considerable number of ag cultural, commercial, industrial, and technic schools and schools for Indian.

cultural, commercial, industrial, and technic schools, and schools for Indians.

The University of Manitoba was establish by an act of the Manitoba Legislature in 18 after the purpose of raising the standard higher education in the Province and of enablial denominations and classes to obtain academ degrees. By an amendatory act of 1917, and government, conduct, management and control of the university is vested in a board of go ernors of nine members, appointed by the lie tenant-governor-in-council. Affiliated colleginclude St. Boniface College at St. Boniface (R. C.); St. John's College at Winnipe (Church of England); Manitoba College ar Wesley College, both at Winnipeg (Unit Church colleges which retain separate charte but have joint executive committee, joint ar faculty, etc.); Manitoba Law School at Winnipeg; St. Paul's College at Winnipeg (R. C. Bibliography — Documents and the standard of th

Bibliography. — Documentary authoritie 'Selkirk Papers' (manuscripts), (Dominic Archives, Ottawa); 'Papers Relating to tl Red River Settlement' (1819); 'Report of S lect Committee' (1857); 'Recent Disturbance (1870); 'The Canadian North-West,' ed. Ol ver (Dominion Archives, 1915). Consult also 'Canada and Its Provinces' (Vols. XIX ar XX); Ross, 'Red River Settlement' (1856) Hargrave, 'Red River', Martin, Chester, 'Se kirk's Work in Canada'; Begg, 'History of th North-West'; Bryce, 'Manitoba'; Schofiel 'Story of Manitoba'; De Lury, 'Mineral Propects in Southeastern Manitoba, Rice Lak Maskwa River and Boundary Districts' (1920) Kitto, F. H., 'Manitoba: Its Development an Opportunities' (Ottawa); Manitoba Government Liquor Control Commission (annual reports); Mackintosh, W. A., et al., 'Economi Problems of Prairie Provinces' (Toronto 1936)

MANITOBA, Canada, a lake situated in Mariti's province, to which it gives its name, a loat 50 miles suithwest of Lake Winnipeg It is of irregular snape, 110 miles long, with a maximum breath of 20 miles, a shore-line of 535 miles, an area of 1,171 square miles and an average depth of 12 feet. It is 810 feet a ove sea-level, and 40 feet higher than Lake Winnipeg, lino which it drains through the Saskatchewan or Dauphin River.

MANITOBA, University of. The Canadian province of Manitola, which was formed out of Rupert's Land in 1870, was the outgrowth of the Red River Settlement founded by Lord Selkirk and his immigrants under Hudson's Bay Company auspices in 1812-15. The Settlish settlers were joined from time to time by the Métis, the descendants of French-Canadian volageurs, who married Indian women, and also by the children of company omicers and Orkney employees of the Hudson's Bay Company who had taken Indian wives. This mixed community in 1870 numbered 12,000

To the Métis came from Lower Canada Priest (afterward Bishop) Provencher, who in 1818 established a school, which grew in later times into Saint Bonnface Roman Catholic College. The English-speaking halt-breeds belonging to the Church of England were educated at Saint John's College, which was reorganized in 1866 by Bishop (afterward Archbishop) Machray. Just as the new province of Manitoba was forming there was established during the year 1871 in Kildonan, near Winnipeg, among the Selkirk Scottish settlers, a Presbyterian college, known since as Manitoba College. This last-named college was in 1874 removed to Winnipeg. These three denominational colleges were all in or near the new city. In 1875 an important meeting was held in the courthouse, Winnipeg, by Manitoba College, in which a union of the three colleges under a provancial university was suggested. Governor Morris favored this plan, and in 1877 an act was passed in the legislature of Manitoba establishing the University of Manitoba, to which the three colleges, Saint Boniface, Saint John's and Manitoba, were affiliated The university was at first to be only an examining body, the teaching being done entirely by the colleges.

The new university was unique. It brought together the largest religious bodies of the province and kept up the standard of education, it being the only source of degrees. Its first examinations took place in May 1878, when seven candidates presented themselves. In 1878 application was made to the Dominion government for a land grant, and at length, in 1885, under the "Better Terms Settlement" of that year, 150,000 acres of good agricultural wild land was given to the university. This endowment is now valued at \$1,600,000. In 1883 a native of Red River Settlement living in England, Mr. A. K. Isbister, who like many others was attracted by the broad and cosmopolitan spirit of the young university, bequeathed \$83,000 as sethlership fund to the varieties.

000 as a scholarship fund to the university.

In 1882 the Manitoba Medical College was founded and became affiliated to the university.

In 1888 a new member of the sisterhood of Colleges—Wesley College of the Methodist Church—was affiliated to the university; a college of pharmacy was affiliated in 1902.

In 1893 the University Act was changed to allow teaching to be done by the university in natural science, mathematics and modern languages, the affiliated colleges taking up the other departments. In 1898 a site of seven acres in the heart of Winnipeg, valued at \$120,000, was given by the Dominion government to the university, and in 1900 the first

building was erected

In recent years on the erection of new government buildings, two commodious law buildings contiguous to the university grounds have been transferred to the university for its increasing needs. In 1903 the University Act was changed to permit teaching in the classics, natural science, mathematics and modern languages, engineering and business training, still depending on the denominational colleges for teaching in the other arts subjects. Degrees are now given by the university in arts, law, medicine, science, engineering, pharmacy and agriculture. The several affiliated denominational colleges have the power to bestow degrees in theology on students who have passed certain arts requirements in the university. These degrees on being reported to the university become ipso-facto degrees of the university.

In the first decade of this century an agnicultural group of buildings was erected on a site contiguous to Winnipeg costing some \$4,000,000. On a provincial farm this cluster is equipped under a large staff representing the many phases of agriculture. It is said that this complete group is not surpassed by any set of similar buildings on the continent. The Manitoba Agricultural College is affiliated to the university. A university library growing to be worthy of recognition is now established in

the university.

In the last decade of its history a very large addition has been made to the work of the arts and sciences in the university, including a law school, to civil, electrical and mechanical engineering departments, and to the branches of pharmacy, commercial education and architecture. There are upward of 50 instructors

now on the university faculty

Not only has this great development taken place in the University of Manitoba, but it is to be remembered that in less than two decades three provincial universities of western Canada, viz., those of Saskatchewan province at Saskatoon, of Alberta at Edmonton and of British Columbia at Vancouver, have been established and are developing greatly, thus cutting off a vast field of supply from Manitoba University. Under the new act of 1917 Manitoba University has become strongly supported by the provincial government, and still retains the support of the denominational colleges, which ching to their former affiliation. Notwithstanding the great demands of the World War, the number of students in the year 1917-18 reached 932. During the war the enrolment fell to 500, rising in 1939 to 4,122.

Founder of Manitoba College and a Founder of the Manitoba University

MANITOBA SCHOOL QUESTION. In 1871, shortly after the colony of Assiniboia had become a province of Canada under the name of Manitoba, a law was passed establishing a dual system of denominational public schools, serving respectively the needs of the French

(Roman Catholic) and English-speaking (Protestant) population in the province. At this time these racial and religious components were pretty evenly divided; but immigration from Ontario speedily gave a marked preponderance in numbers to the English-speaking section, and n 1889 it was reported that of the 618 schools in the province 545 were Protestant and 73 Roman Catholic. An agitation against the system of separate schools had begun to gather volume, and in 1890 under Premier Greenway an act was passed in the provincial legislature at olishing all sectarian schools and establishing a common school system, under which all school taxes, whether derived from Protestants or Catholics, were appropriated to the support of the new public schools. The passing of this act was hotly resented by the French-speaking Catholic population as an attack on their language and religion, and as an invasion of the terms of the British North America Act and the Manitoba Act, which guaranteed minority rights in regard to education Under the leadership of Archbishop Taché an agitation for its repeal was engaged in by his coreligionists throughout the Dominion, but the act was permitted to come into force by the federal government. A test case, however, was taken to the law courts; the judgment of the Provincial Court sustained the validity of the act, while the Supreme Court of Canada declared it to be ultra vires. The final court of appeal, the Judicial Committee of the Privy Council, reversed the decision of the Supreme Court and de-clared for the validity of the act. Appeal was then made to the Dominion government to pass a remedial act, which the Prime Manister, Sir Charles Tupper, introduced in 1896; but the measure failed to carry through the diverse sectarian elements in the House of Commons, and the government suffered defeat in the ensuing general election. A compromise was then effected under the premiership of Sir Wilfrid Laurier, the most important feature of which was embodied in clause 258 of the School Law of 1897, which provided "that where 10 of the pupils speak the French language (or any language other than English) as their native language, the teaching of such pupils shall be conducted in French (or such other language) and English upon the bilingual system. The clause, it will be observed, is somewhat loosely drawn and does not properly define what is meant by the bilingual system No provision was then (or afterward) made for the adequate staffing of the schools with bilingual teachers. Shortly after the passing of this law a great immigration into the Canadian West began and Mani-toba became a polyglot province. The result of this influx was seen in the 1911 census, when the total number of persons of foreign birth -Germans, Austrians, Poles, Jews, Russians and Scandinavians stood at 100,000. At the end of Scandinavians stood at 100,000. At the end of 1915 it was reported that there were 126 French schools with 7,393 enrolments; 61 German schools with 2,814 pupils, and 111 Ruthenian or Polish schools with 6,513 pupils. One-sixth of the entire school population were being educated in bilingual schools. There were five school districts in which bilingual education might have been demanded in three languages other than English and 36 districts in which other than English and 36 districts in which the same claim might have been made for two languages other than English. Under these

conditions education remained very backward in the province—a situation that was aggravated by the indifference of communities such as the Mennonites to education itself as tending to draw its members away from the simplicity of their faith and teaching. It was only after long agitation that in the session of the legislature of 1916 clause 258 of the School Law quoted above was rescinded and nothing put in its place—a law which left Manitoba, like Prince Edward Island, New Brunswick and British Columbia, without any provision as to language in its schools. Education was at the same time made compulsory on all children between 7 and 14 years

MANITOU, man'i-too, a name given, among the American Indian tribes, to any spirit or supernatural being, good or evil; also applied to any object of religious awe and reverence "The Illinois," wrote the Jesuit Marest, "adore a sort of genius, which they call manitou; to them it is the master of life, the spirit that rules all things. A bird, a buffalo, a bear, a feather, a skin—that is their manitou." "If the Indian word manitou," says Palfrey, "appeared to denote something above or beside the common aspects and agencies of nature, it might be natural, but it would be rash and misleading to confound its import with the Christian, Mohammedan, Jewish, Egyptian or Greek conception of Deity, or with any compound of a selection from some or all of those ideas." The word was applied to any object used as a fetish or an amulet. It was common among all Western and Mississippi tribes.

MANITOU SPRINGS, Colo., town and resort in El Paso County; alt. 6,336 feet, 5m. NW. of Colorado Springs, and 9m. from the summit of Pike's Peak; on the Denver and Rio Grande Western; Midland Terminal; and Manitou and Pike's Peak railroads The town has been known as Manitou and Manitou Iron Springs. The Manitou and Pike's Peak cog railway, more than eight miles long, goes to the summit of the Peak, and there is an inclined railway to the top of Mt. Manitou (9,455 feet). Its healthgiving, highly radioactive mineral springs of soda and iron, saturated with carbonic acid gas, flowing a quarter-million gallons daily, were known to the Indians and were a neutral ground, their sacred character being marked by the name Manitou meaning "Great Spirit" John Charles Frémont (qv), explored this region in 1843 and analyzed the waters, which for a while were called Frémont Soda Springs. West of the town is Pike National Forest, part of the Pike's Peak State Game Refuge, and one of the largest forest preserves in the state. Near by are many scenic attractions, such as the Garden of the Gods, with unusual shapes and colors due to erosion, the Cave of the Winds, Rainbow Falls, and Ute Pass Like Colorado Springs, Manitou was developed largely by General William Palmer, who, with Dr. William A. Bell, founded it in about 1872. Pop. (1940) 1,462.

MANITOULIN (măn-i-too'lin) IS-LANDS, Canada, a group of islands in the northern part of Lake Huron, partially separating the waters of the lake from Georgian Bay, and east of the famous "Soo" Canal. The name is a corruption of the Indian word Manitowin, which means divinity. Except Drummond Isle, about 25 miles long and 9 miles

which the library to the State of Michigan, the state of a tart of the produce of Ontario. The library is a tart of the group is Grand Manitudes at the wholes. The coast is very irregular of children or Little Manitoulin, is nearly reclar, and about the Manitoulin, is nearly reclar, and about the little miles in diameter. All the State is are well wooded; Grand Manitudin and Children have large pine forests. The short waters about in fish Fully half the minimum and the strains and chimate in summer and the strains natural features add to the attractions of the San is and make them a favorite summer resort. Pop. 2,000.

MANITOWOC manitatowalt. Wis city.

MANITOWOC, man-i-tō-wŏk, Wis, city, port of entry, and Manitowoc County seat; alt. 5:5 feet; on Lake Michigan, at the mouth of the Manitowoc River; 77m. N. of Milwaukee; on the Arn Arbor, Pere Marquette; Soo; and Chicago and North Western railroads; with ferry connections across Lake Michigan to Frankfort and Ludington, Michigan. Within a semi-circle of low hills, it has a good harbor and regular steamer connection with all of the important lake ports; large grain elevators, shipbuilding and repair yards, and an extensive coal trade Improved water, rail and highway transportation facilities have enhanced the city's importance as a shipping and shopping center. A municipal airport and numerous bus and truck lines complete the transportation network Commercial fisheries are of importance Shipbuilding was the city's distinctive industry from about 1860 to 1890; then on a much smaller scale until the World War of 1914-18, when the industry revived. Submarines, yachts, lake and ocean stemmer are built Other industry. steamers are built. Other industrial products are aluminum-ware, and aluminum castings, yeast, canned vegetables, flour and malt products, condensed milk, cheese, beer, vinegar, flour, cement, tires, metal furniture, tinsel, paper containers, knit goods and electric timers. A fur trading post was set up here by Jacques Vieau for the British North West Company in 1795. Permanent settlement began with the land boom of Hanner settlement began with the land boom of 1835. Many Germans settled here in 1848, followed soon by Norwegians and Irish; Bohemians in 1854, and Poles after 1865. The city was chartered in 1870. The name is an Indian word meaning "land of the Great Spirit." Pop. (1920) 17,563; (1930) 22,963; (1940) 24,404.

MANIZALES, mā-nē-sā'lās, Colombia, town, south of Antioquia and capital of Caldas, about 95 miles northwest of Bogota. The altitude is about 7,000 feet. It was founded in 1848 and its situation at the junction of main passes over the Corderilla Central range of mountains and near valuable gold mines has contributed to its rapid growth. In the valleys, in the vicinity, stock-raising is an important industry. It has fine churches and schools, a good library and a number of comfortable homes. During the civil war of 1877-78 the town was the headquarters of the rebels. The climate is not severe, although in a high altitude, as higher mountains in the vicinity are a protection. Pop. about 85,000.

MANKATO, man-kā'tō, Minn., city, county seat of Blue Earth County, on the Minnesota River at the mouth of the Blue Earth River and on the Chicago, Milwaukee, Saint Paul and Pacific; the Chicago Great Western; the Chicago and North Western; and the Chicago, Saint Paul, Minneapolis and Omaha railroads, about 85 miles southwest of Saint Paul It is situated in an agricultural region and in the vicinity are valuable stone quarries. Nine miles south is the Rapidan dam, furnishing hydroelectric power for numerous southern Minnesota cities and villages Mankato is the leading metropolis of southwestern Minnesota, and the trade center not only for that section, but also for northern Iowa, and eastern South Dakota. Its factories produce brick, cement, clothing, leather goods, flour, foods, boxes, brooms, and numerous other items. The Mankato hog market is the third largest in the state, and the poultry indus-try and the creamery business are important

factors in the city's commerce.

Mankato is the Sioux name for the blue earth found in the vicinity, specimens of which Le Sueur shipped to France in 1701 believing them to be copper-bearing. The city was settled in 1852 by three men from St. Paul—Henry Jack— Son, Parsons K. Johnson, and Daniel Williams. During its early days Indians caused much trouble. Following the uprising of 1862, over 400 Sioux Indians were tried for murdering white settlers, and 303 condemned to death were brought to Mankato and held at Camp Lincoln, now Sibley Park President Lincoln commuted the sentences of all but 38 and these were hanged simultaneously from a single gallows on Dec 26, 1862 Mankato was incorporated July 15, 1858, and chartered as a city March 6, 1868. It is the seat of a state teachers college and of Bethany Lutheran College. Pop. (1940) 15,654.

MANLEY, man'li, John, American naval commander: b. 1734; d. Boston, 1793. At the outbreak of the Revolutionary War he had command of the armed schooner Lee, with which he cruised along the coast of Massachusetts Bay, making captures of great value to the American army then investing Boston. In July 1778 his ship, the *Hancock*, was captured by a British frigate and after a rigorous confinement in Halifax, he was exchanged and in 1782 was put in command of the Hague frigate, which, after lying in a perilous position on a sand bank off Guadeloupe for three days, exposed to the fire of four British ships of the line, contrived to effect her escape This exploit closed the regular maritime operations of the United States during the Revolutionary

MANLEY, Joseph Homan, American journalist and politician: b. Bangor, Me, Oct. 13, 1842; d. Augusta, Me., Feb. 7, 1905. He was graduated from the Little Blue Abbott Academy at Farmington, Me., in 1858 and in 1862 from the Albany Law School. He was admitted to the bar in 1865. In 1866 he was are resident of the the bar in 1865. In 1866 he was president of the city council of Augusta and in 1881 was appointed postmaster of Augusta by President Garfield, which office he held for seven years. Acquiring a half interest in the Maine Farmer he joined hands with James G. Blaine in aggressive local and national politics, dictating the editorial policy of that paper for three years. He was a delegate to the Republican National conventions of 1880 and 1888, was for many years chairman of the Maine Republican State Committee and a member of the Republican National Committee, and was a notable figure in

the executive committees of 1896 and 1900, which aided in the election of McKinie;.

MANLEY, Mary de la Rivière, English author b. in the Island of Guernsey about 1663; d. London, July 11, 1724. She succeeded Swift as editor of the Exammer in 1711. She is known for her Secret Memoirs and Mainers of Several Persons of Quality of Both Sexes from the New Atlantis (1709), a licentious satire reflecting on politicians of the day, that caused the arrest of both the author and the publisher though they were subsequently discharged. This work was continued in the Memoirs of Europe (1710). She also published Letters Written by Mis Manley (1696); The Secret History of Queen Zarah and the Zarazians (1705); The Adventures of Revella (1714); The Power of Love in Seven Novels (1720), and other unimportant books

MANLIUS, măn'li-ŭs, Marcus, Roman legendary hero, of the 4th century BC, called Capitolinus because of his successful defense of the Capitoline Hill Tradition says he was aroused to action by the cackling of Juno's sacred geese just in time to prevent the surprise of the citadel by the Gauls (390 BC) Two years before he defeated the Aequi, and in six years after (384 BC) was thrown from the Tarpeian rock, having been declared guilty of plotting to become king or dictator. This judgment, almost certainly unjust, was due to the envy of the patricians, who distrusted Manlius' philanthropic endeavors to free plebeians sold for debt.

MANLY, Basil, American clergyman and educator b. Pittsborough, Chatham County, NC, Jan. 28, 1798; d. Charleston, SC, Jan. 25, 1865 He was graduated at South Carolina College in 1821, and, after filling several charges, in 1837 he became president of the University of Alabama, remaining there nearly 20 years.

MANLY, John Matthews, American educator and author: b. Sumter County, Ala, Sept. 2, 1865, d. April 2, 1940 He was graduated from Furman University in 1883 and from Harvard in 1889, and took his D.Ph. at Harvard in 1890. From 1891 to 1898 he was associate professor and professor of English at Brown University and from 1898 to 1933 was professor and head of the department of English at the University of Chicago. In 1909 he was Chicago exchange professor at the University of Gottingen He was a member of the Modern Language Association. He contributed to the Cambridge History of English Literature and to the Encyclopaedia Britannica and to various periodicals. He edited Macbeth (1896): Specimens of the Pre-Shakespearean Drama (1897); English Poetry (1907); English Prose (1909); A Manual for Writers, with J. A. Powell (1914); English Prose and Poetry (1916); Contemporary American Literature (1922); Some New Light on Chaucer (1926).

MANN, SIR Donald D., Canadian contractor and financier b Acton, Ontario, March 23, 1853. In the later 70's he went West, became manager for a firm of contractors who had a sub-contract on the Canadian Pacific line and thereafter worked continuously as a contractor until the completion of the main railway. Between 1881 and 1883 he completed various contracts for railroads and in the two follow-

ing years began railroad-building in the mountains. He also undertook contracts for construction and timbles in Colorona Cañon and in the Sclkirk Range of the Rocky Mountains. Together with Sir William Mackenzie (qv) he constructed the Canadian Northern Railway (qv). In 1887 and a part of 1888 they constructed the Canadian Pacific short line through Maine. In December 1888 Mr. Mann visited Panama, Ecuador, Peru and Chile with a view of building roilways for the Chilean government, but was not satisfied with the prospects there and declined the contract offered. Later he visited China. He was associated with the building of the Qu'Apelle, Long Lake and Saskatchewan Railway, and was one of the original syndicate which built the Winnipeg Electric Street Railway. He was also interested in many other enterprises. He was knighted in 1911. He died Nov. 11, 1934.

MANN, Heinrich, German novelist, brother of Thomas Mann (qv) b Lubeck, March 27, 1871 He attended the Katharmeum School in his native city and then entered business. In 1893 he moved to Munich, later changing his abode to Berlin, with frequent sojourns in Italy, particularly Florence His permanent home he finally fixed at Munich. Like his brother Thomas, Heinrich is a reserved, unsociable character, who has developed a feeling almost of hostility for the types of German life with which he is surrounded. His mother was partly of creole origin, and this circumstance is taken by some German critics (eg, Kurt Martens in his essay in Literatur in Deutschland, 1910) as explaining Heinrich's predilection for the life and literature of the Romance countries as opposed to those of the Germanic countries as opposed to those of the Germanic countries. His first works were volumes of short stories: Das Wunderbare (1897); Em Verbrechen und andere Geschichten (1898); Next came novels: In einer Familie (1898); Im Schlaraffenland (1901); Die Göttinnen, oder die drei Romane der Herzogin von Assy (3 vols, 1902–03); Die Jayd nach Liebe (1904). Die Gottinnen represents an ideal of womanhood in three different phases (Diana, Miherva, Venus) and is a brilhantly constructed hymn of joy in the Romance style. Again he turns to the short story Floten und Dolche (1905), Professor Unrat (1905); Eine Freundschaft (1906). Zwischen den Rassen (Bernatschaft) tween the Races, 1908) is a novel dealing with the affection of a young girl, Lola Gabriel, for a German and an Italian, who are supposed to incorporate the virtues of their respective races. It has met with great popularity, but the attempt to capitalize racial characteristics in this way is too great a task for all but the greatest men. Heinrich Mann has also tried his hand at the drama, in Die Schauspielerin (1911), but with no particular success. JACOB WITTMER HARTMANN.

MANN, Horace, American educationist: b. Franklin, Mass, May 4, 1796; d. Yellow Springs, Ohio, Aug 2, 1859. He was graduated from Brown University in 1819, studied law at the Litchfield (Conn.) Law School and in offices at Dedham, Mass., in 1823 was admitted to the bar, and practised at Dedham from 1827 to 1833, when he removed to Boston. In 1827-33 he was a representative in the state legislature, in 1833-37 state senator and in 1836-37 presi-

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dent of the senate. From the first he idendent of the senate. From the first he identified himself with philanthropic interests. His first speech in the assembly was on religious histories; and one of his enterprises was the establishment of the State lunatio hospital at Worcester (1833), in connection with which he was chairman of the board of commissioners and later of the board of trustees. In 1837, upon the appointment by the State of a board of education to revise and represente the Massaof education to revise and reorganize the Massa-chuseus common-school system, Mann became secretary to the board (19 June). He withdrew from politics and from a lucrative practice at the bar, and devoted himself entirely to a work which proved of the greatest significance not for Massachusetts only but for the entire United States. This work he accomplished largely in spite of opposition often pronounced For the reform of State education he founded to be a completed from the company of the counted for the company of the counted for the company of the counted for the counted the and edited the monthly Common-School Journal, held teachers' conventions, published 12 most valuable annual reports and established normal schools In 1843 at his own expense he visited hurope for the study of Continental methods. He was successful in arousing throughout the country an unprecedented interest in educational affairs. In 1848 he was elected to Congress to succeed John Quincy Adams, deceased; and he served until March 1853. He was strongly opposed to slavery, and fearlessly attacked Webster's course. On 15 Sept. 1852, he declined the nomination for the governorship of Massachusetts, and on the same day accepted the presidency of Antioch College, Yellow Springs, Ohio, in which post he served until his death, greatly influencing the educational development of Ohio. He was a Fellow of the American Academy of Arts and Sciences In addition to Academy of Arts and Sciences In addition to his annual reports he published 'Reply to 31 Boston Schoolmasters' (1844); 'Report of Educational Tour' (1846); 'A Few Thoughts for a Young Man' (1850); 'Slavery: Letters and Speeches' (1852); 'Lectures on Intemperance' (1852); 'Powers and Duties of Woman' (1853); and 'Sermons' (1861). Consult the 'Life' by Mary P. Mann (1865); and Boone, 'Education in the United States' (1890); 'Report' (United States Commission of Education, 1895–96); Hubbell, G. A., 'Life of Horace Mann' (1910). Mann' (1910).

MANN, James Robert, American congressman: b. near Bloomington, Ill., 20 Oct. 1856. He was graduated at the University of Illinois in 1876 and at the Union College of Law, Chicago, in 1881. He was admitted to the bar in 1881 and thereafter practised law at Chicago. He was attorney for the village of Hyde Park in 1888 and upon its annexation to Chicago he became alderman of the 32d ward, serving in 1893-96. He was temporary chairman of the Republican State Convention in 1894. He was master in chancery of the Superior Court in Cook County in 1892-96, and general attorney of the South Park Board, Chicago, in 1895. He was elected to Congress in 1896 and served continuously until his death, 30 Nov. 1922. He was leader of the Republican minority in the House during the Wilson Administration.

MANN, Matthew Derbyshire, American gynecologist: b. Utica, N. Y., 12 July 1845; d. Buffalo, N. Y., 3 March 1921. Graduated at Yale 1867, at College of Physicians and Surgeons, Columbia, 1871, he later studied in Europe. He

practised medicine in New York in 1873-79; was established as a specialist in obstetrics at Hartford, Conn., in 1879-82; and in 1880-82 he was clinical lecturer on gynecology at Yale. He was professor of obstetrics and gynecology at the University of Buffalo in 1882-1910, and later was consulting gynecologist and obstetrician at the Buffalo General Hospital He was president of the American Gynecological Society in 1894. He edited 'American System of Gynecology' (1888). Author of 'Manual of Prescription Writing' (1879).

MANN, Thomas, German writer of novels and short stories: b Lubeck, 6 June 1875, of a wealthy family of merchants, whose traditions of solidity and solvency surrounded him in his youth and gave him the material for his treatment of the family life of the Hanseatic patricians in 'Buddenbrooks' and other works. After his father's death (1893) the family settled in Munich, where Mann joined them later (1894), and where he became an apprentice in the offices of the South German Fire Assurance Bank, a position of which he soon wearied. He attended lectures on æsthetics and literature at the University of Munich, later lived at Rome, returning to Munich in order to join (1899) the staff of Simplicissimus (qv), to which he remained attached for a number of years Mann has a delicacy and refinement of style and observation that are unparalleled in German literature. In his first long novel, 'Buddenbrooks' (1901), which established his literary reputation, as well as in his short stories, he captivates by a psychologic naturalism which is enhanced by the fact that the feelings depicted are those of well-to-do middle class persons in comfortable, if not luxuriant, surroundings. Henry James, whose attention is usually devoted to a higher social class, is the English novelist whom Mann's delicate and insinuating treatment most resembles, and the two men are also similar in their scrupulous precision and artistry of language. (Der Tod in Venedig) ('A Death in Venice,) 1913), which has the proportions of a German novelle (about 100 pages), describes the last hours of an elderly German writer. (Der Zauberberg) (The Magic Mountain), published in 1926, is generally conceded to be his greatest novel. It contributed much toward making him the Nobel Prize Winner in Literature in 1929. He has written many short stories, some essays, and a play. Later works are 'Joseph and His Brethren' (1937); 'Joseph in Egypt' (1938); 'The Coming Victory of Democracy' (1938) The Nazi régime forced him into exile. In 1938 he came to the United States and the same year was made lecturer at Princeton University.

MANN, Tom, English Socialist: b. Foleshill, Warwickshire, 15 April 1856. His boyhood was spent in farming and mining and from the age of 14 he served an apprenticeship of seven years at engineering in Birmingham; in 1877 he went to London, where he was prominent in connection with various trade-union affairs, and in 1885 he became a Socialist. Among his works are 'The International Socialistic Movement'; 'Russia in 1921'; 'Tom Mann's Memoirs.' D. England, 13 March 1941.

MANN, William Julius, Amercan Lutheran clergyman, educator and author: b.

Stuttgart, Germany, May 29, 1819; d. Boston, Mass, June 20, 1892. He was educated at Stuttgart and Tubingen and was ordained in the Lutheran ministry in 1841. He came to the United States in 1845 with Dr. Philip Schaff. He was assistant pastor at Saint Michael's and Zion's congregation, Philadelphia, in 1850-63, pastor in 1863-84 and thereafter pastor emeritus. He was professor of Hebrew ethics and symbolics at the Lutheran Theological Seminary at Philadelphia from the time of its establishment. Author of Plca for the Augsberg Confession (1856); The Lutheran Church and its Confessions (1880); Life and Times of Henry Melchoir Mühlenberg (1887), etc.

MANNA, a name for several substances, especially a saccharine matter which exudes naturally or from incisions made in the trunk and branches of a species of ash (*Fraxmus ornus*). It first appears as a whitish juice, thickens on being exposed to the air and when dried forms a whitish or reddish granular substance, which is the manna of commerce. The tree is a native of Italy and is cultivated extensively in Sicily. June and July are the two months in which the manna is collected. It is detached from the trees with wooden knives and is afterward exposed to the sun for drying. A little rain, or even a thick fog, will often occasion the loss of the collections of a whole day. The taste is sweet and slightly nauseous. It is a mild purgative and is principally administered to children. The finest kind of manna is called flake manna; it is white or yellowish-white in color, light, porous and friable. Sicilian manna is generally found in small, soft, round fragments; its color is yellowish-brown and it is generally mixed with more or less impurities. The principal constituent is mannite, chemically separable as a white crystalline substance of a sweetish taste, which also appears as a whitish efflorescence on certain edible seaweeds and fungi. To this and the saccharine elements, the nutritiousness of manna is due.

Many other sweet tree-juices go by the name of manna, or false manna, since they contain no mannite, but depend for their peculiar qualities upon the possession of melitose or meletzitose. In many cases the exudation of the sap is due to the irritation produced by insects or is the product of the insects themselves. Thus edible exudations are obtained from the Oriental teatree, sandal-wood and an Australian grass (Andropogon); in Europe from the larch and an oak, and in Persia from the camel's thorn. American manna is derived in California from the sugar pine and from a rush (Phragmites); while in India a species of bamboo secretes it so copiously as to form an important food-resource for the people in periods of famine.

The tamarisk manna, derived from the tamarisk trees about the eastern end of the Mediterranean, is not a direct product of the tree, but of a scale-insect, the manna-insect (Jossyfraria mannifera), which abounds upon the tamarisk and secretes the substance, which some persons have regarded as the manna of the Bible. In Australia the waxen larval cases of several species of flea-lice (Psyllidae) that feed upon the gum-trees (Eucalyptus) are gathered and eaten by the natives under the name of "lerp."

The Scriptural manna (Heb. Man-hu, what is it?) is described in Exodus (xvi, 15) as covering the ground in such quantities as to supply food for the vast multitude of the Israelites. It was small and round like corrander seed, white and tasting like honey and wafer. It was of the color of bdellium (Num. vi, 7). According to the Biblical narrative it was the food of the Children of Israel for 40 years. They complained of the diet (Num. xi, 6). In Rabbinical literature there are a vast number of stories about the manna hard to accept except as myths. It cannot be identified with any of the substances known nowadays as manna; but is called in the Bible "bread from heaven," while the Jewish doctors taught that it became to each person who ate it that meat of whatever kind he liked best

MANNAIA. See Guillotine.

MANNHEIM, man'hīm, Germany, a large town of Baden on the Rhine, at the confluence of the Neckar, 45 miles south of Frankfort. It lies in the administrative district of Mannheim, of 1,386 square miles area and 707,303 population. Dikes protect it from inundation and there are extensive harbors and modern docks. A bridge across the Rhine, here 1,200 feet wide, connects with Ludwigshafen, Bavaria, and there is also a bridge across the Neckar. Mannheim is the first commercial town in the Free State and on the upper Rhine This it owes to its admirable position on two important navigable rivers and its railway communications. During World War I it was important as a distributing point for the German army. It was several times bombed by French and British air-craft, but without serious damage. The principal articles of trade are corn, flour, wood, petroleum, coal, tobacco, cattle, sugar, iron goods, etc. The manufactures consist chiefly of iron-castings, machinery, chemicals, cigars, carpets, woolen goods, paper, tiles, celluloid and rubber wares, mirrors, carriages, trinkets, sugar, liqueurs, starch, glue, etc Mannheim was once strongly fortified and lying not far from the French frontier and near the center of military operations, suffered severely during the wars between France and Germany. In a siege by the Austrians in 1795 only 14 houses remained uninjured. Hence, notwithstanding the antiquity of its foundation, it has become an entirely modern town with regular, straight streets, known, as in America, by numbers, and with fine public squares. The principal buildings are the former Palatine palace, with a museum and picture gallery in one of its wings, a public library of 75,000 volumes and good gardens behind it; the Jesuits' church, an imposing edifice, with a profusely decorated interior; the former observatory building; the theater, one of the best in Germany; several gymnasia and schools, conservatory of music, hospitals and orphanage, town-house, railway station, etc. In 1899 the suburb of Neckaran was incorporated with it. Pop. (1939) 283,801.

MANNING, man'ing, Daniel, American journalist and financier: b. Albany, N.Y., May 16, 1831; d. there Dec. 24, 1887. At 10 he entered the printing office of the Albany Atlas which shortly after was merged in the Argus, upon which paper he became a reporter and in time an authority in state politics. He was as-

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MANNING, Henry Edward, cardinal of MANNING, Henry Edward, cardinal of the Roman Carni In Church and archlishop of Vieston stern I. Tottendee, Hertiordshire, 15 July 18/08; Il Viestoninster, 14 Jan. 1892. He was clarated at Harrow and Bailiol College, Cod rid Ireame a Fellow of Merton College in 1832 and in that year he was ordained and appointed curate of Woollavington-cum-graffiham in Sussex. In 1833 he became rector of Woollavington and was appointed archideacon of Chinarington and was appointed archideacon of Chinarington and was appointed archideacon of Chinarington. layington and was appointed archdeacon of Chi-chester in 1840. In 1842 he was select preacher to the University of Oxford. He took very little part in the tractarian movement and did not write any of the tracts, but he formed friendships with some of the leaders of the movement. In 1851, after the decision in the Gorham case," he joined the Roman Catholic Church and was ordained priest. He founded the Congregation of the Oblates of Saint Charles at Bayswater, London, in 1857, and upon the death of Cardinal Wiseman was conscioused archbishop of Westminster in 1865. At the Œcumenical Council in 1870 he was an ardent supporter of the infallibility doctrine, and in 1875 was made a cardinal by Pius IX. Manning was a trusted leader of the Ultramontane party in his Church, and he commended himself to the world in general by his zeal on behalf of temperance, education and the betterment of the working-classes. He is the author of tour volumes of sermons published before 1850; and among his other writings are 'The Temporal Mission of the Holy Ghost' (1865 and 1875); 'Petri Privilegium' (1871); 'The Vati-1875); 'Petri Privilegium' (1871); 'The Vatican Decrees' (1875); 'The Catholic Church and Modern Society' (1880); 'The Eternal Priesthood' (1883); 'Characteristics' (1885); 'Miscellanies' (1877-88); 'Religio Viatoris' (1889). Consult Lives by Hutton (1892); Purcell (1896); Ward (1897); De Pressensé (1903); Fitzgerald, 'Fifty Years of Catholic Life and Progress' (1901). Consult his Memoriale (1802) morials (1892).

MANNING, James, American Baptist educator, first president of Brown University: b. Elizabeth, N. J., 22 Oct. 1738; d Providence, R. I., 29 July 1791. He was graduated at Princeton College in 1762, in 1763 became pastor of a Baptist church at Morristown, N. J., and about a year later pastor of a church in Warren, R. I. There he almost immediately commenced a Latin school, which seems to have been in some sense the germ of Rhode Island College. He had previously proposed to several influential men in his denomination, assembled at Newport, the organization of "a seminary of polite literature, subject to the government of the Baptists" and had drawn up a plan for such an institution. In 1764 the legis-

lature granted them a charter, and in 1765 he was appointed "president and professor of languages and other branches of learning, with full power to act in these capacities, at Warren or elsewhere" The college went into operation at Warren in 1766, and the first commencement was held there in 1769, when a class of seven was graduated In 1770 it was determined to remove the college to Providence, and during the Revolution, when the college edifice was occupied as a military barrack, and afterward as a hospital, he was actively engaged in clerical duties and also rendered important services to the patriotic cause. In 1783 he resumed his duties at the college, and in 1786 represented Rhode Island in Congress, where he exerted himself to secure the adoption of the national Constitution From 1770 till the year of his death he was also pastor of the first Baptist church in Providence He resigned the Guild, 'Life and Times of James Manning and the Early History of Brown University' (1894). See Brown University

MANNING, Robert, American pomologist: b Salem, Mass, 19 July 1784; d there, 10 Oct. 1842. He established a pomological garden at Salem in 1823 with the purpose of establishing the identity and classifying the various varieties of fruit. His efforts accomplished a great public benefit in introducing to general use the best varieties of fruit and in standardizing the nomenclature. At the time of his death his fruit garden contained more than 1,000 varieties of pears and many hundreds of apples, peaches, plums and cherries. He was an uncle of Nathaniel Hawthorne. Largely through his efforts the Massachusetts Horticultural Society was established and he was a generous contributor to its support. Author of 'Book of Fruits' (1838).

MANNING, Thomas Courtland, American jurist: b Edenton, N. C., 1831; d New York city, 11 Oct. 1887 He was graduated from the University of North Carolina, admitted to the bar and for a time practised law in his native place, but in 1855 he went to Alexandria, La, and there established himself in a large practice. He was a delegate to the Secession Convention and at the outbreak of the war entered the Confederate army as lieutenant. He served as adjutant-general in 1863 and attained the rank of brigadier-general. In 1864 he was associate judge of the Supreme Court of Louisiana. He was a presidential elector in 1872 and 1876, and in 1877 he was chief justice of the State Supreme Court. He was denied admission to the Senate upon his appointment to that body in 1880, and in 1882-86 he again filled the office of justice of the Supreme Court. He was appointed Minister to Mexico in 1886 and died in office.

MANNING, William Thomas, American Protestant Episcopal clergyman: b. 1866. He was graduated at the University of the South in 1893. He was ordained deacon in 1889 and priest in 1891; and in 1892 he was rector at Redlands, Cal. He was professor of dogmatic theology at the University of the South in 1893-95; and was rector at Landsdowne, Pa., in 1896-98, and at Nashville, Tenn., in 1898-1903. He became vicar of Saint Agnes' Chapel, New York, 1903; was appointed assistant rec-

tor of Trinity Parish, New York, in 1904, and rector in 1908. In 1921 he was made bishop of New York.

MANNING, S. C., town, Clarendon County seat, alt. 91 feet, on the Black River (not navigable), the Atlantic Coast Railroad, and state and federal highways, 70m N. of Charleston. It makes tobacco-curring stoves; has mayorcouncil government, owns its water-supply system. It was named for Gov. John L Manning. Pop. (1930) 1,884; (1940) 2,381.

MANNING, or MANNYNG, Robert, English poet: b. 1264; d. 1340? See Brunne,

ROBERT OF.

MANNINGTON, W. Va., city in Marion County; alt. 967 feet; 60m SE. of Wheeling; on the Baltimore and Ohio Railroad It is situated in a region with varied farm crops, and oil and m a region with varied faint crops, and on and gas wells. Pottery, glassware, tools, and cement blocks are the city's industrial products Pop. (1930) 3,261; (1940) 3,145.

MANNITE, or MANNITOL, a singular chemical compound which has the formula

C.H. (OH) and constitutes from 30 to 60 per cent of the weight of the dried juice which exudes from the manna ash (Fraxinus ornus), a tree growing in the Mediterranean regions It occurs also in many other plants and is formed in the lactic fermentation of sugar, and also in the spontaneous fermentation of the juice of the sugar-cane, in tropical countries. It may be prepared by boiling manna with dilute alcohol, the mannite crystallizing out upon cooling. The crystals are then purified by recrystallization from water. It is a white compound, crystallizing in needles or four-sided prisms, and is readily soluble in water, insoluble in ether and but slightly soluble in alcohol. It melts at 329° F and begins to sublime at about 400° F. Mannite has a pleasant, sweet taste and in some respects it resembles the sugars. It is not a sugar, however, but a hexatomic alcohol. (See Sugar, nowever, but a nexatomic alcohol. (See Alcohol.). Chemically, it is derived from the hydrocarbon hexane, C_0H_{14} , by the replacement of six atoms of hydrogen by six molecules of hydroxyl (OH). Sorbite (or sorbitol) and dulcite (or dulcitol) have the same chemical formula as mannite and resemble it very closely They are, in fact, isomers of mannite. Sorbite is prepared from mountain ashberries, and dulcite from Madagascar manna. See Manna.

MANNLICHER, man'lih-er, Ferdinand, RITTER VON, Austrian engineer and inventor: b Mainz, Jan. 30, 1848; d. 1904. He was chief engineer of the Northern Railroad for many years, and after the success of the needle-gun at Sadowa in 1866 began experiments which ultimately produced a magazine rifle which was adopted by the Austrian army in 1885. He became famous for his numerous inventions in small arms and was elected to the Upper House of Austria in 1899 in recognition of his distin-

guished services.

MANNY, Walter Baron de, English soldier and philanthropist: d. 1372. His memory is perpetuated as the founder of Charterhouse School (q.v.), and by his military exploits as recorded by his friend Froisart in his Chronicles. Scion of a noble family of Hainaut, he arrived in England in 1327 in the train of Queen Philippa, rose to high rank in the Scottish wars of Edward III, became a commander of the English fleet, and of the army in

France, and both in military commands and in diplomatic negotiations received the commendation of the king. He was created a baron and knight of the garter and in 1335 married the Countess, later the Ducless of Norfolk. Consult Froissart's Chronicles (Globe ed, Eng. trans., London 1895).

MANOBAS, ma-nō'bas, a native tribe of the Philippines, living chiefly in the valley of the Rio Agusan, island of Mindanao, and at some places in the district of Dávao, Mindanao They are of Malay race, head-hunters and largely heathen, though the work of the Jesuits among them has resulted in a considerable portion becoming Roman Catholics. The name in earlier times was often applied to other heathen tribes of Mindanao.

MANŒUVRES, ma-noo'verz See Army AND NAVY MANGUVERS.

MANOMETER (Greek, "rarefaction measurer"), an instrument for measuring the pressure exerted by gas or liquid. It may have many forms, of which the mercurial barometer is one. (See Barometer). One of the commonest designs for the measurement of pressures not greatly different from that of the atmosphere, consists of a U-tube, one of whose legs is open to the air, while the other is in communication with the gas or liquid whose pressure is to be measured. The lower part of the U is filled with some non-volatile liquid of known density, and the difference between the pressure of the fluid under examination and that of the atmosphere is found by observing the difference between the levels of the manometric fluid in the two branches of the U-tube. If the absolute pressure of the fluid is desired, it is necessary to add the atmospheric pressure to the differential pressure as read from the manometer. In rough work it may be sufficient to assume the atmospheric pressure to be 147 pounds per square inch; but in more refined observations the atmospheric pressure must be determined by reading the barometer, simultaneously with the manometer. Mercury is commonly the liquid that is used in the U-tube, but when the differences in pressure that are to be read are very small, some less dense liquid may be used with advantage. Sulphuric acid is often employed in such cases; and where (as in the measurement of chimney draft) a slight amount of evaporation from the manometric fluid is unimportant, water may be employed. When the pressure to be measured materially exceeds one atmosphere, the siphon manometer, as just described, is modified by sealing one of the ends of the U-tube, instead of leaving it open to the air. In this case the pressure is determined by observing the amount of compression that it produces in the air that is confined in the sealed arm of the siphon, by the manometric fluid; for it is known by Boyle's law, that the volume of the air in this arm is sensibly proportional to the reciprocal of the absolute pressure, so long as the temperature remains constant. Boyle's law is not rigorously exact, however, and when a high degree of precision is required from the compression manometer, it is necessary to make allowances for its error. Data for this purpose have been given by Amagat, up to 85 atmosspheres, when the temperature of the manometer is maintained at 16° C. (60.8° F.). Consult Amagat, 'Comptes Rendus,' Vol. XCIX, p. 1153; Presson, 'Theory of Heat,' p. 403). In steam engineering the communest form of manometer is the 'Bourdon Laure,' which depends for its action up it the elastic deformation of a flattened metallic time when exposed to an internal pressure. In practice the flattened tube is bent into a circular form one end of it being fixed. into a circular form, one end of it being fixed while the other communicates, by means of a multiplying gear, with an index hand which travels over the face of a graduated dial. A tube so constructed straightens out slightly when subjected to an internal pressure, return-ing again to its original form when the pressure is removed. The deformation is approximately proportional to the magnitude of the pressure (so long as the tube is not strained beyond its elastic limit), and hence the dial may be graduated, without difficulty, so as to indicate true pressures, at least to a degree of precision quite sufficient for the purposes of steam engineering. All such gauges should be carefully compared with a standard mercury column, however, before great reliance is placed upon them; for it is found that they are sometimes seriously in error in some parts of the scale, even when sensibly correct in other parts. In using them in connection with steam boilers, care should also be taken to prevent steam or highly heated water from coming into direct contact with the curved tube, since the elastic properties of the tube are injured by overheat-To ensure the proper protection of the gauge, a siphon, or a complete circular bend, should be placed in the pipe between the gauge and the boiler. The trap so formed will fill with water of condensation the first time the boiler is fired up, and thereafter it will be impossible for steam to enter the gauge directly.

MANON LESCAUT, a short novel of 200 pages, the seventh volume of a larger work, "Memoirs of a Nobleman," has sufficed to assure the reputation of its author, Prévost d'Exiles (1697-1763), better known as L'Abbé Prévost. After a life of adventure in France, England, Holland and Germany when he was in turn soldier, monk, journalist, teacher and later chaplain of the Prince of Conti, Prévost became a professional writer and composed more than 100 volumes. He also translated many English works, and among those, his adaptations rather than translations of (Pantela,) (Clarissa Harlowe) and (Grandison) gave to Richardson a great popularity in France during the second half of the 18th century, to the detriment of Prévost's own works. Of all Prévost's novels, critical articles in the peniodical Pro and Con and pseudo-scientific travel stories, Manon Lescaut alone survaves Pub-lished in Holland in 1731, it "took like wild fire" according to contemporary testimony and more than 30 editions were printed before the end of the century, that of 1753 revised and corrected by the author being considered as the best. This novel is the story of the passionate love of the young Chevalier des Grieux for the courtesan Manon. It is told in a simple narrative style and with a sincerity which leads us to believe that Prévost relates at least in part some episodes of his stormy life. The novel presents a realistic and painful picture of the sufferings which uncontrolled passion brings upon those who lack the will power to resist it. and while Prévost does not attempt to excuse or justify the faults of his heroes, he shows passion as a terrible force whose victims are to be pitied rather than blamed Prévost had many imitators even in his own time, and the theme of Manon, dealing with rehabilitation through love and sufferings, is found later in 'Mar.on Delorme' (Hugo), 'La Dame aux Camélas' (Dumas), 'Sapho' (Daudet) and in the works of several Russian novelists.

Louis A. Loiseaux.

MANOR (old French manour, maneir, from L. manere, to remain, being the residence of the owner), a piece of territory held by a lord or great personage, who occupied a part of it. as much as was necessary for the use of his own household, and granted or leased the remainder to tenants for supulated rents or services. No manors, with all their incidents and franchises, have been granted in England since the reign of Edward III. One of the most important incidents to these ancient manors was the right to hold a court, called a court-baron, which was held within the manor, and had jurisdiction of misdemeanors and nuisances within the manor, and disputes about property be-tween the tenants. The manor system was in

still retained by the present owners of large MANOURY, General. See MAUNOURY.

estates. See also TENURE

vogue in the United States only during the

British occupation, but many old manor names like Briarcliffe manor, Pelham manor, etc., are

MANRIQUE, man-rē-kā, Angel, Spanish poet and ecclesiastic: b. Burgos, 1577; d. Badajos, 1649. He rose to high rank in monastic life, becoming finally head of the Cistercienses throughout Spain, and finally bishop to the control of of Burgos (1645). He wrote a history of the Cister order which had considerable reputation throughout Europe. He also wrote many devotional and other works of a religious or religio-historical nature.

MANRIQUE, Gómez, Spanish poet and dramatist: b. about 1415; d 1491. He was son of Pedro Lord of Amusco, and a younger brother of Rodrigo Manrique, master of Santiago and one of the troubadours of the court of John II. He became a soldier of some note and took part in wars against the Moors. He sided with the Infante, Don Enrique, against Alvaro de Luna and the royal court. He was almost every political disturbance and warlike expedition of Spain in his day. He was very much mixed up in the political move which forced the marriage of Ferdinand of Aragon and Isabel of Castile, which was of great significance since it ultimately led to the expulsion of the Moors from the country and the political and national unity of all Spain. He attained to numerous high offices under the king of Aragon and later under the united crowns of Castile and Aragon, becoming finally a member of the royal council and the confidant of the joint sovereigns. Gómez Manrique, notwithstanding his tempestuous and warlike life, was one of the greatest orators of his age and a talented poet. He was one of the set of writers who sang the glories of the Virgin Mary and their love for and devotion to her. He was a satirist with a keen sense of humor, and he attempted nearly every class of literature known in his day in Spain.

He played his part in helping to introduce into Spanish poetry the poetical forms of Italian Literature. He also wrote religious dramas in the form in which they appeared in his age. For this reason and for the fact that he introdired more than customary life into these dramatic pieces, his work had considerable in-fuence on the development of the drama, both The best of his religious dramas, all of which are of a liturgical caste, is 'Representacion del nacinuento de Nuestro Señor' He also wrote on political and philosophical subjects and on matters of ethics and vices such as gluttony, envy, laziness, and of virtues, such as reason (in human actions), faith, prudence and honesty of purpose in government His poem on the death of the Marques de Santillana became immensely popular and Gómez Manrique rose to be the most quoted writer and most recited lyrical poet of his day His Cancionero' has been published several times and poems of Gómez Manrique have appeared in various other cancioneros Consult Menéndez y Pelayo, Marcelino, 'Antologia de poetas liricos castellanos' (Vol VI, Madrid 1886); Pas y Melia, A, 'Cancionero de Gómez Manrique' (Madrid 1885); Ríos, Amador de los, 'Historia critica de la leteratura española.)

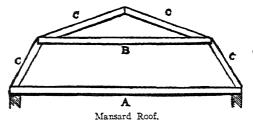
MANRIQUE, Jorge, Spanish poet: b. about 1440; d 1479. He was son of Rodrigo Manrique, grand master of Santiago He early took a prominent part in the troubles of the reign of Henry IV, taking sides with Don Alfonso. Notwithstanding the fact that most his life was passed in active military duty and that he died in battle in the attack on the fortress of Garcí-Muñoz, he yet attained such an eminence as a poet that he is still classed among the great writers of Spain, and a worthy nephew of Gómez Manrique (qv) and heir of his father, Rodrigo Manrique, who was one of the successful troubadours at the court of John II, one of the foremost patrons of lyrical poetry. Jorge Manrique has written saures, love songs and poems of a like nature common to the age in which he lived, but his most noted poem and the one to which he owes his lasting fame is 'Coplas de Jorge Manrique por la muerte de su padri 'This is one of the finest lyrics in the Spanish language, instinct with true poetic form and thought and sympathy. This poem has been imitated and praised by some of the greatest writers of Spain and it has found universal favor in the eyes of the critics. Longfellow has made a worthy translation of it into English; and it was set to music as far back as the 16th century by Venegas de Henestrosa. (See Coplas De Manrique; ROMANCERO DEL CID). Consult Longfellow's translation and Fitzmaurice-Kelly, James, 'A History of Spanish Literature' (New York 1898); Menéndez y Pelayo, Marcelino, 'Antología de poetas lirícos castellanos' (Vol. VI, Madrid 1896); Biblioteca de autores españoles (Rivadeneira, Vols. XXXII and XXXV) contains his works and notices thereof.

MANS, mān, Le, France, the capital of the department of Sarthe, on a height above the Sarthe, here crossed by three bridges, 115 miles southwest of Paris. It consists of a lower and an upper town. The principal edifice is a fine Gothic cathedral of the 11th century. It has a

seminary, excellent schools, a public library of 60,300 volumer and several museums. The chief manufactures are metal works, railway cars, tobacco, canned goods, chemicals, cordage, leather and woolen and linen goods; being a railway centre it is a distributing point for farm produce, canned goods, wines, etc. Le Mans existed in the time of the Romans under the name of Cenomani, a tribe who inhabited the district. Numerous vestiges of Roman structures (subterranean aquicducts, walls, etc.) still remain. It was long in the possession of the English, and Henry II, the first Plantagenet, was born here. During the Franco-German War (1870-71) General Chanzy was defeated here by Prince Frederick Charles and the Grand-duke of Mccklenburg. A monument commemorates the battle.

MANSARD, man-sar, or MANSART, François, fran-swa, French architect: b. Paris, 23 Jan. 1598, d there, 23 Sept. 1666. He designed many important buildings in Paris, as well as provincial chateaux and country seats. The chateaux at Blois are partly his work, and he built the church of Val de Grâce and the Hotel Carnavalet. The mansard roof is called after him.

MANSARD ROOF, in architecture (so called from François Mansard, or Mansart (q.v.), a French architect to whom the invention is attributed), a roof formed of two sets of rafters, of which the upper set are more inclined to the horizon than the lower set, and



form an obtuse angle at the ridge. The transverse beams connecting the lower ends of the under set of rafters are called as in ordinary roofs tie-beams; the corresponding beams at the union of the upper and under rafters are called collar-beams.

MANSART, Jules Hardouin, zhul ār-dooăn man-sar, French architect: b Paris, 16 April 1645; d. Versailles, 11 May 1708. He was a nephew of François Mansart, or Mansard (q.v.). He directed all the great building operations of Louis XIV, who heaped favor and wealth upon him. His works include the palace at Versailles; the Maison de Saint-Cyr; the Grand Trianon; the triple dome of the Invalides, and the Chateau de Clagny, the residence of Madame de Montespan. He also designed the Place Vendôme and the Place des Vactoires.

MANSE, in Scotch law, a name given the dwelling-house of the minister of the Established Church. In popular use the term is often applied generally to the dwelling-house of any minister of a dissenting congregation. In the Established Church every first minister of a rural parish is entitled to a manse, which the heritors or landed proprietors in the parish are bound to build and uphold. When a manse has

been line or recalled by the heritors it becomes a tree manse, and all or many regains have to be derivative charges of the minister.

MANSEL, Henry Longueville, English I gland and evolg and U congrove, Northamptons are, United at 12 Landley, July 31, 1871 lie was edicated at Saint July's College, Oxford, at 1 to the orders in the Anglican Church in 1845. He became Walnelete professor of philosophy at Outlind in 1850, regius professor of ceclesiastical history, 1867, and dean of Saint Landley, London, 1868. He was made a canon of Christ Church, Oxford, in 1867.

MANSFELD, mans'felt, Peter Ernst I, Col NT, Austrian general and statesman b July 15, 1517 d Luxemburg, May 22, 1604 He becar e governor of the Low Countries after the death of the Duke of Parma.

MANSFELD, Peter Ernst II, Count, German Protestant military leader. b Luxemburg, 1580, d Racowitza, Bosnia, Nov. 29, 1626 He was a natural son of the preceding, but, disappointed in regard to the inheritance of his rather's lands, joined the Protestant princes and became the bitter enemy of Austria. He gained a victory over Tilly at Wiesloch in 1622, but was defeated by Wallenstein at Dessau in 1626, and died soon after.

MANSFIELD, mănz'fēld, Edward Deering, American author b New Haven, Comm., Aug. 17, 1801; d. Morrow, Ohio, Oct. 27, 1880. He was graduated at West Point in 1819 and at Princeton in 1822 when he took up the study of law and was admitted to the bar in 1825. He went to Cincinnati to engage in practice until 1835 when he accepted the chair of constitutional law and history in Cincinnati College. He resigned to enter journalism and was editor of the Cincinnati Chronicle, the Atlas and the Railroad Record. For many years he was a contributor to New York newspapers under the title "Veteran Observer."

MANSFIELD, Joseph King Fenno, American soldier: b. New Haven, Conn., Dec. 22, 1803; d near Sharpsburg, Md, Sept. 18, 1862. He was graduated from West Point in 1822 and in the Mexican War became chief engineer under General Taylor. He took an active part in the engagements at Fort Brown, Monterey and Buena Vista. In 1853 he was appointed inspector general of the United States Army and served in that capacity until 1861 when he was made brigadier-general and given command of the Department of Washington. He was in command of a corps of the Army of the Potomac at Antietam and was killed there.

MANSFIELD, Katherine (pseudonym of KATHLEEN, nee BEAUCHAMP, be'cham, MURRY), British writer: b. Wellington, New Zealand, Oct. 14, 1888; d. Fontainebleau, France, Jan. 9, 1923. She lived most of her early childhood in the small township of Karori near Wellington. At 14, she went to London to school and, except for a two-year visit in New Zealand, spent the remainder of her life in Europe. Her first short stories were published in small literary magazines. Upon the publication of her volumes of short stories, Bliss in 1921 and The Garden Party in 1922, it was immediately recognized

that hers was one of the rare talents of 20th century literature. She was married twice, to George Bowden in 1909, whom she divorced and in 1918 to John Middleton Murry, the English critic Because of poor health she speriouslierable time in the south of France and died at thirty-five from tuberculosis

In her stories, Katherine Mansfield disregarded plot to relate simple, meaningful incidents with a sensitivity and a masterful sense of character delineation that have seldom been equalled. The stories are admired and loved for their warm, sympathetic quality and an undertone of heartbreak. In The Doll's House she uses a plaything to show the natural cruelty of children and the domineering social attitudes of adults. In The Garden Party she tells of an adolescent's first experience with death, at the close of what had been an idyllic summer's day. A Cup of Tea is a study of the mixed emotions of a vain young wife who would like to be charitable. In Bliss she shows that a blooming pear tree can overpower a woman with its beauty and then in an instant become a symbol of silent mockery

Her best known stories can be found in innumerable anthologies; her husband, J. Middleton Murry, has edited biographical material, including: The Journal of Katherine Mansfield (1927); The Letters of Katherine Mansfield (1928); and The Scrapbook of Katherine Mansfield (1939). See also New Zealand Literature and Art; English Literature, Twentieth Century—Fiction

MANSFIELD, Richard, American actor: b Heligoland, May 24, 1857; d. New London, Conn., Aug 30, 1907. He first studied art, opening a studio in Boston, but later returned to England and entered the theatrical profession. He played small parts in comic opera, and first appeared in America as Dromez in Les Manteaux. Noires at the Standard Theatre, New York. He afterward was very successful in a wide variety of plays and became the head of his own company. He created such parts as Beau Brummel, Baron Chevrial, Dr. Jekyll and Mr. Hyde, and Monsieur Beaucaire; among his other most successful rôles were Cyrano de Bergerac, Shylock, Henry V, Brutus, and Peer Gynt.

MANSFIELD, William Murray, EARL OF, British jurist b. Scone, Scotland, March 2, 1705, d London, March 20, 1793. One of the youngest sons of 5th Viscount Stormont, he was educated at Christ Church, Oxford; studied law; was called to the bar in 1730; won a large Scottish practice and many literary friends, the foremost being Alexander Pope. In 1742 he was made solicitor general and entered Parliament. Though of Jacobite descent he upheld the Hanoverian interest in 1745, did special service in 1748 by his defense of the Treaty of Aix-la-Chapelle, and was admitted leader of the House An attempt to prove him guilty of treason or disloyalty to the Crown was unsuccessful, although often repeated. He was made attorney general in 1754 and chief justice and Baron Mansfield in 1756. He became Earl of Mansfield in 1780 suffered at the hands of the Gordon rioters because of his sympathy with Catholic emancipation. In 1788 he retired from the bench. Although unpopular and constitutionally a believer

in royal prerogative, Mansfield was a great judge, whose work was not too conservative, and an able, calm, logical debater. Possibly his greatest labor was his revision of the mercantile law.

MANSFIELD, England, a market town and municipal borough in Nottinghamshire, 15 miles north by west of Nottingham, in a deep valley, in the midst of a rich coal district, surrounded by vestiges of Sherwood Forest. There are cotton mills, manufactures of silk and cotton hosiery, lace thread-mills, boots and shoes and cigar-making. It is supposed to mark the site of a Roman station. Pop. 44,000.

MANSFIELD, La, town and De Soto parish seat; alt. 332 feet; 34m. S. of Shreveport; on the Kansas City Southern Railroad; has an airport. It is a shipping center; has a Civil War battlefield park, and is governed by a mayor and council. Pop. (1940) 4,065.

MANSFIELD, Mass, town in Bristol County, alt. 178 feet, on the New York, New Haven and Hartford Railroad, 24m. SW of Doston. Long an industrial town, its products include cotton fabrics, tanks, taps and dies, jewelry, and foundry castings. It has a board of selectmen and a town manager. The water system is publicly owned. Pop. (1930) 6,364; (1940) 6,530.

MANSFIELD, Ohio, city and Richland County seat, alt. 1,200 feet, on the Pennsylvania; Erie, and Baltimore and Ohio railroads and on state and federal highways, 40m S of Lake Erie. It makes brass, electrical appliances and motors, rubber tires and tubes, sheet steel and tin plate, gas ranges, plumbing fixtures, woolen knit goods, and farm implements. It has mayorcouncil government, with a service director or city manager. There is a municipal airport here; a Carnegie library; a historical museum; a hospital, and a tuberculosis sanitarium Mansfield is the seat of a state reformatory. The city was named in honor of Jared Mansfield, survey or-general of the United States, under whose direction it was laid out by Gen. James Hedges. The plants of the Ohio Brass Company and the Westinghouse Company are show places. In Middle Park there is a monument to Johnny Appleseed (John Chapman). Pop. (1930) 33,525; (1940) 37,154.

MANSFIELD, Pa., borough in Tioga County; alt. 1,174 feet; on Tioga River, and the Erie Railroad; 29m. SW. of Elmira, N. Y It is in a farming, bituminous coal, and gas area and is noted for its manufacture of novelties. It has a public library and here is the Mansfield State Teachers' College. The site, cleared as a field by Asa Mann in 1804 and known as "Mann's Field," later became a village and was incorporated in 1857. Pop. (1940) 1,880.

MANSFIELD, Mount, in Vermont, one of the highest elevations of the Green Mountains, 4,405 feet; in the northwestern part of the State, about 23 miles east of Burlington. The view from its summit includes the Adirondack and White mountains, Lake Champlain, a large portion of the northern part of Vermont and some of New Hampshire. See GREEN MOUNTAINS.

MANSFIELD COLLEGE, Oxford, England, a theological institution established in 1886 for the education of men for the Noncon-

formist ministry. It owes its inception chiefly to Congregational support. Its students must be graduates of some recognized university, or undergraduates of Oxford who have passed Moderations. The staff consists of a principal, a vice-principal, three lecturers and a bursar. Mansfield House, at Canning Town (West Ham), is a settlement in connection with the college.

MANSFIELD PARK. This quietly charming novel of manners, published in 1814, is perhaps less popular than some of the other works of Jane Austen, but it is regarded by more than one critic as even superior to them in richness and maturity. As the title implies, the story is built around. English countryhouse life. Fanny Price, an indigent niece, is taken into the family of Sir Thomas Bertram Overlooked for the most part by Sir Thomas and his wife, subjected to the carping control of the odious Mrs. Norris, Lady Bertram's sister, and neglected or patronized by three of her cousins, Fanny finds her chief consolation in the casual kindness of her remaining cousin, Edmund, whom she grows to love But Ed-Edmund, whom she grows to love But Edmund is attracted by the dashing and sophisticated Mary Crawford, who with her brother, Henry, is visiting at the neighboring rectory. Henry, in turn, after various flirtations with the Bertram sisters, pays suit to Fanny The unfolding of these several relationships by means of seemingly insignificant incidents dances, excursions, amateur theatricals-constitutes some of Miss Austen's most skilful work and affords her opportunity for those delicately humorous, mildly ironical accounts of the life she knew best, that have made her immortal. Of course in the end Henry and Mary Crawford are eliminated and Edmund loves and marries his Cinderella-like cousin. No single character in this novel is as well known as Mr Collins of Pride and Prejudice or Miss Bates of *Emma*; yet the various personages are excellent examples of the author's nice discrimination and marvelous insight. Each character is clearly portrayed though not unduly simplified; each exhibits in varying proportions that mixture of good and evil common to all mankind. In a word, the characters are not types or Elizabethan "humors," but are richly human. Mansfield Park appeals to many classes of readers. It is the best kind of historical novel, for it records vividly the manners and customs of ordinary folk in the Napoleonic era. It is a superb example of a serene, balanced realism, avoiding alike the rose-pink and the dirty drab that Meredith later reprehended. It is an almost flawless instance of pure comedy in fiction. Consult Howells, W. D., Heroines of Fiction; Cornish, Francis Ware, Life of Jane Austen; Smith, Goldwin, Life of Jane Austen.

MANSHIP, Paul, American sculptor: b. Saint Paul, Minn., Dec. 25, 1885. He received his early education at the Saint Paul Institute of Arts, where he evinced marked talent for sculpture, and later studied at the American Academy in Rome. His first achievement was the winning of the Helen Barnet prize, in the National Academy of Design in 1913, and he won this again in 1917. He was also awarded a gold medal at the San Francisco World's Ex-

GEORGE B. DUTTON.

position in 1915. His statues are to be seen in the Metropolitan Museum in New York, Pratt I state, Brooklyn, Art Insutute, Chicago, and other leading institutions.

MANSILLA DE GARCIA, Eduarda, a-los-artila man-sellya da car-sella, Argentine manistri b Buenos Aires, 1838. Her maiden name was Marsalla; at 16 she marined Manuel R. Carcia, a diplomat, and at 19 published 'El Ménico de San Luis,' possibly her best novel. It was followed by 'Lucia Miranda,' a historical novel on the discovery of La Plata, and by 'Pablo, 6 la Vida en las Pampas,' which with its fresh description of Argentine life maile a great impression in Paris and was praised by Hugo. She was a musician of much talent and wrote, besides novels, several plays.

MANSION HOUSE in London England.

MANSION HOUSE, in London, England, the cilicial residence of the lord mayor, built on the site of the Old. Stock Market in 1739 from designs by George Dance, at a cost of \$213,190. It is an oblong building and contains an Egyptian banquet hall accommodating 400 guests

MANSLAUGHTER, the killing of a human being; in criminal law the second degree of felonious homicide Murder and manslaughter are distinguished from each other by the intent which causes or accompanies the act. If a homicide be not justifiable nor excusable, and yet be not committed with malice aforethought, it is manslaughter and not murder. It is quite certain that the intent need not be to kill; for while there must be a criminal intent to make a person amenable to law as a criminal, yet if one crime be intended, and in the act of committing it another of a higher character be also committed without intent, the criminal is responsible for this higher crime. The general principle laid down in respect to manslaughter is, that not only a positive intention to commit some crime, but mere negligence, may make one guilty. If any one take upon himself an office or duty requiring care or skill, he is liable for the want of either; and if death be the con-sequence of his ignorance or carelessness, he is guilty of manslaughter So if one driving furiously run over and kill a person whom he did not see, or if one in command of a steamer or sailing-vessel by reason of gross negligence run down a boat and some one in it be drowned, this would be manslaughter. So, if any one, whether medical by profession or not, deal with another as a physician, and through gross want of care or skill kill him, or if any one charged with building a house of any kind construct it so badly that it falls and kills persons within or near it; or if in building he drop a stone upon some one passing below and kill him; in all these cases he would be guilty of manslaughter, provided he were grossly negligent in the act causing the This is the essential question. death.

Blackstone defines manslaughter thus: "Manslaughter is the unlawful killing of another without malice either express or implied; which may be either voluntarily, upon a sudden heat, or involuntarily, but in the commission of some unlawful act."

The judicial treatment of this crime, being regulated by statute, varies in the several States. The element of premeditation is not essential to conviction of this crime. There are cases

which the law regards as only manslaughter, without evidence of momentary excitement; partly because the law infers that from such a provocation there must be excitement; and partly, perhaps, because the party killed brought his death upon himself by his outrageous wrong. Thus, if a husband detects his wife in adultery and instantly and purposely takes either her life or the adulterer's, it is only manslaughter Not so, however, if he waits for a subsequent opportunity, for then the first reason wholly fails, and the killing becomes murder.

In New York State four degrees of man-slaughter are defined The first carries a pen-alty of not over 20 years' imprisonment, the second degree not over 15 years The first degree, briefly stated, consists of killing without the purpose of death, when the deceased was engaged in perpetrating or attempting a crime less than felony, and where such killing would be, at common law, murder. Assisting in selfmurder is manslaughter in the first degree, as also wifully killing an unborn quick child by injury to the mother if it would be murder in case the mother died from the injury. The second degree consists in procuring abortion otherwise, killing in the heat of passion without the intent of death, but in a cruel and unusual manner; or killing unnecessarily one attempting to commit felony. The third degree is killing in heat of passion, without intent of death, but with a dangerous weapon; involuntary killing, by procurement or negligence of another, while the person killed is engaged in committing a trespass on property; suffering an animal known to be mischievous to go abroad without care, or keeping it without care, and thereby causing death; receiving wilfully or negligently so many persons in a boat or vessel as to cause death; racing while in command of a steamboat carrying passengers, bursting the boiler, and so killing, killing by a physician while in a state of intoxication The fourth degree may be said to include all other modes or forms of manslaughter, known as such at common law, and of a milder kind than the preceding. There is much difference between the States in the penalties prescribed. Some States, as Louisiana, Maine and Maryland, assign "not over 20 years" to both first and second degree manslaughter, thus practically leaving the penalty to the judge's discretion; other States, as New Hampshire and South Carolina, call for "not over 30 years," while Texas, West Virginia and Delaware place five years as the greatest punishment. Several States make second degree manslaughter "not over one year" in prison. See HOMICIDE

MANSURA, MANSURAH, or MANSOURAH, man-soo'ra, Egypt, a town on the Damietta branch of the Nile, 34 miles southwest of Damietta. It has railway connection with Zagazig and Cairo and is the chief depot of the bread-stuffs, cotton, indigo, hemp and flax which this part of the Delta produces There are also linen and cotton manufactories, etc. Mansurah was founded in 1221 and here in 1250, during the Crusades, Louis IX of France was captured and imprisoned. Pop. about 64,000.

MANTA, man'tä, Ecuador, city, port of entry on the Pacific Coast, about 155 miles southwest of Quito. It has an excellent harbor and steamer connection with nearly all the Pacific

Coast towns of South America. It was founded as early as 1534-35, and for many years its importance has been in being the port of Monteristi, which is about 10 miles inland. The chief exports are coffee and rubber. Pop 8,000

MANTALINI, mån-ta-le'ne, a low and affected character in Dickens' (Nicholas Nickleby) who lives on the labors of his wife, mantuamaker.

MANTARO, man-ta'rō, a river in Peru which has its rise in the mountains in the western part of the province of Junin Its source is about 13,000 feet above the sea It flows south and east to Huanta, near which it breaks through the mountains and turns northwest which course is continued for about 60 miles, when again it changes and flows northeast to Pisquiuni, where it joins the Apurimac River and forms the Ené The Mantaro is nearly 300 miles long and navigable only a short distance above the junction with the Apurimac It has extensive water power which is not used except in a few cities

MANTEGAZZA, Paolo, pa'ō-lō man-tā-gàt'sa, Italian author and physiologist. b. Monza, Italy, 1831, d 1910. He was educated at the universities of Pisa and Milan, spent several years in traveling, visiting almost every portion of the globe, after which he returned to Milan and practised medicine there. He was appointed professor of physiology at Pavia in 1860 and in 1870 became professor of anthropology at Florence, where he founded the Museum of Anthropology, also a society and a review of anthropology. He was a member of the Italian Parliament 1865-76 and then became senator. He is the author of many medical and philosophical books; among them are 'Elementi d'igiene' (1875); 'Fisiologia del piacere' (1881); 'Le istasi umane' (1887), 'L'anno 3000' (1897); 'L'amore' (1898), etc. He has also written books of travel and has devoted a share of his attention to political affairs.

MANTEGNA, Andrea, Italian painter: b. Vicenza 1431; d Mantua, 13 Sept 1506. His master, Squarcione, was induced by the talents which he displayed to adopt him as a son The youth employed himself principally in drawing from antiques, and at the age of 16 painted a picture for the grand altar in the church of Saint Sophia at Padua About 1468 Mantegna entered the service of Ludovico Gonzaga, at Mantua, where he opened a school. Here he painted his great picture, the 'Triumph of Julius Cæsar,' for the tapestry of a palace erected in Mantua It consists of several cartoons, which have since been transferred to Hampton Court. Gonzaga conferred on him the honor of knighthood in reward for his merit Innocent VIII invited the artist to Rome to paint in the Belvidere. One of the best of this artist's works is the 'Madonna della Vittoria,' now in the Louvre at Paris, in which Giovanni Francesco Gonzaga is seen returning thanks for the victory gained by him in 1496 over the forces of Charles VIII The genuineness of this picture is, however, sometimes doubted. There are several others of his works in the Louvre, and an 'Annunciation' in the Dresden Gallery. The New York Historical Society has his 'Crucifixion,' the Metropolitan Museum 'Holy Family,' the Johnson Gallery in Philadelphia

his 'Adoration of the Maci' He was also noted as a line engraver, and left many notable copper plates of both religious and historical subjects. Consult Bell, N. R. E., 'Mantegna' (New York 1911)

MANTELL, Gideon Algernon, English recologist b Lewis, Sussex, 1700; d London, 10 Nov. 1352 For many years he practised as a medical man, and employed his leisure time in studying the strata and fossil remains of the weald district, by which he was surrounded. Through his investigations the fossilized skeletons of the Izuanodon and Hylæosaurus were discovered, the fresh-water origin of the wealden beds demonstrated and many other important facts established in regard to the geology of that district He published 'The Fossils of the South Downs' (1822); 'Illustrations of the Geology of Sussex' (1822), and the very popular 'Wonders of Geology' (1838); and 'Medals of Creation' (1844). His magnificent collection of fossils was purchased in 1839 for the British Museum.

MANTELL, Robert Bruce, American actor: b Irvine, Scotland, 7 Feb. 1854; d. 27 June 1928 He made his début at Rochdale, England, in 1876, and in 1878 played in juvenile rôles with Modjeska in the United States He then spent three years in England as leading man, returning to New York to play with Fanny Davenport He became a star and played at the head of his own company, presenting the leading classical and romantic rôles, including Hamlet, Macbeth, Romeo, Richeleu, etc.

MANTES, mant, France, a town in the department of Seine-et-Oise, on the left bank of the Seine, opposite Limay, with which it communicates by two handsome bridges connecting the banks with an island in the river, 29 miles west-northwest of Paris. It contains a fine Gothic church, with two lofty towers; a beautiful Gothic tower, the only remains of the church of Saint Maclou; and has manufactures of tiles and baskets, famous breweries, numerous mills and a trade in leather, corn and wine William the Conqueror received his death-wound at Mantes. Pop. 9,700.

MANTEUFFEL, mān'toif-fĕl, Edwin Hans Karl, Baron von, German field-marshal: b Dresden, 24 Feb. 1809; d. Karlsbad, 17 June 1885. He entered the army in 1827 and advanced rapidly, becoming lieutenant-general of cavalry 1861. He took part in the Danish War of 1864, and next year was appointed governor of Schleswig. During the war between Prussia and Austria he commanded the army of the Main, and fought at Hemstadt, Vettingen, Rossbrunn and Wurzburg. He served with distinction in the Franco-German War, especially in several actions around Metz, at Amiens, and from June 1871 to July 1873 he commanded the army of occupation in France, and was made field-marshal. In 1879 he was appointed governor-general of Alsace-Lorraine, and in this capacity showed singular want of skill and tact in ruling a conquered people.

MANTI, măn'tī, Utah, city, Sanpete County seat, alt. 5,548 feet, on the Denver and Rio Grande Western Railroad, 126m. S. of Salt Lake City. It is situated in a sheep-raising region. Poultry and dairy products are handled. The city has a Carnegie library, a hospital, a

National Grand armory, and a county-city jail. There is a Mormon temple ture; also, three born is sureles and a Presbyteman church. The range Plant, to them from the CBook of Mormon Mant. has a mayor and council Its water surgers, \$10,000 from mountain streams rup (1880), 2,200, 1940, 2,258

MANTINEA, relatively. Greece, one of the most at centual important cities of Arcadia, on the first of Arcadia, on the state is now known as Palæopoli, at 1 conventions and explorations by the French is the walls and failures of the ancient city Mantisea yas known for its wealth, and famous for the tailes fought near it, in 418 bc, when the failures, Ather ans and Mantineans were diseased by the Spartans, in 385 bc, when the city was taken and destroyed by the Spartans, and in 362 bc, when the Thebans under Epaminentals defeared the Spartans, although the victory of the Thebans was purchased with the life of their commander. Mantinea was, in 226 bc, surprised by Aratus; and in 222 bc taken by Antigenus Dosen; on this occasion the town was sacked, and the inhabitants sold as slaves. Another battle was fought near Mantinea 207 bc, between Machanidas, tyrant of Lacedemon, and Philopemen, general of the Achean League. The latter was victorious, and slew the tyrant with his own hand. The French school at Athens financed an archeologist, G. Fougeres, in uncovering a large arca here in 1888. The ancient city was walled, with towers about 80 feet apart. A large mound-shaped theatre was disclosed, a square market hall and paved roads of different eras. Consult Fougeres, G., 'Mantinée et l'Arcadie Orientale' (Paris 1898)

MANTIQUEIRA, man-tē-kā'ē-ra, Serra Da, Brazil, a mountain range which is in the southeastern part of the republic. It is about 75 miles from the Atlantic and extends nearly parallel with the coast for about 200 miles. The eastern end is near Rio de Janeiro Ranges connected with the Mantiqueira are often included with this range and the name Mitiqueira applied to the whole Mount Itatiaia, the highest peak, is 9,700 feet above the sea. Several large rivers have their sources in this range.

MANTIS, an orthopterous insect of the family Mantidæ. These curious insects, alhed to grasshoppers, abound in many parts of the world, and have always excited popular notice, and have been endowed with many supernatural qualities by the ignorant and superstitions of all countries. They are slender, with long, locust-like legs, oval wings, and a long neck-like prothorax, terminating in an angular head with large protruding eyes. The front legs are stout, spiny, fitted for grasping their prey, and are held up in front of them in an attitude that to some suggest prayer. Hence the names praying insect, prophet and the like often given to the more familiar species; to others they suggest other ideas, as of a horse pawing the air, whence our common species of the Southern States (Stegamomantis carolina) is known as the «rear-horse,» and in Europe these insects are called «camel-crickets». Why it should also be called «mule-killer» is harder to explain; probably it is by confusion with a scorpion also

so called These insects in tropical countries have come to assume various forms and hues similar to the flowers near which they lurk to catch the insects visiting the blossoms - a protective measure which comes under the head of mimicry A large proportion of the insects upon which they feed are injurious to crops, so that they may be regarded as beneficial to man Among the Japanese and Chinese they are made to minister to human amusement also, being kept in cages and made to engage in combats upon which the spectators bet money. The eggs of the mantis are laid in an oval mass upon the stem of a plant, and covered with a tough case of hardened mucus, which shows a curously braided pattern of surface, and is easily recognized

MANTIS SHRIMP, a large crustacean (Squilla empusa) of the order Stomapoda, which dwells in burrows between tide-marks along our Eastern coast, and seizes manne worms, and the like, that come within its reach Its general shape is shump-like, but it has strong claws on the second pair of legs, which much resemble the forelegs of a mantis (qv), are provided with sharp spines, and are so joined that they can be folded back upon themselves like the blade of a clasp-knife, and so take a firm grip upon the struggling captives. It is quite blind, although the eyes appear to be well formed. A well-known European species is gathered for food by the coast people.

MANTLE, (1) a kind of cloak or loose garment to be worn over other garments (2) In heraldry the name is given to the cloak or mantle which is often represented behind the escutcheon (3) A fabric-like covering of salts easily rendered incandescent, for placing over a gas flame to increase the light diffused. See GAS, ILLUMINATION.

MANTLE ROCK, also called REGO-LITH, the loose unconsolidated débris that results from rock weathering. It includes all soils except those of strictly organic origin. If they have resulted from weathering in place, without removal, the soils are called residual; if they have been carried from their place of origin by wind, glaciers or running water, they are said to be transported. The mantle rock varies greatly in thickness. In some places it is entirely absent, in others it is hundreds of feet deep. See Soil.

MANTLING, in heraldry, an ornament depicted as hanging down from the helmet, and behind the escutcheon. It is considered to represent either the cointise, an ornamental scarf which passed around the body, and over the shoulder; or the military mantle, or robe of estate. When intended for the cointise, it is cut into irregular strips and curls of the most capricious forms, whose contortions are supposed to indicate that it has been torn into that ragged condition in the field of battle. When the mantling is treated as a robe of estate, the bearings of the shield are sometimes embroidered on it. A mantling adjusted so as to form a background for the shield and its accessories constitutes an "achievement of arms."

MANTRAPS, engines for the terrifying of trespassers and poachers (formerly often indicated by the warning notice "man-traps and spring-guns set here"), resembled gigantic rat-

traps several feet long. They may be seen in museums, it has long been illegal to set them (save indoors between sunset and sunrise), as a deferse against burglars

MANTUA, măn'tū-a, Italy, a fortified rorthern town, capital of the former duchy, and now of the department of Mantua, 80 miles by rail southeast of Milan, on an almost insular site on the Mincio, which here divides into several arms ending in a marshy and insalubrious lake Communication is maintained between the islands and mainland by several bridges, the chief of which is Ponte di San Giorgio, 800 yards long Mantua is written Mantova by the Italians; it is the see of a bishop, the seat of a civil, criminal and mercantile court, and the residence both of a military governor and of a provincial delegate. The most remarkable edifices are the cathedral, after an elegant design by Giulio Romano, the church of Saint Andrea, conspicuous from a distance by its majestic cupola and Gothic tower; the church of Santa Barbara, containing the mausoleum of Carlo Gonzaga; the church of San Sebastian; the Corte Reale, formerly the ducal palace of the Gonzagas, a huge irregular pile, now partly used as bar-racks; the Castello di Corte or old castle of the Gonzagas; the Torre della Gabbia, the Torre del Orologio, and the Torre dello Zuccaro; the Beccheria and Peschiera, or shambles and fish market, both built by Giulio Romano, the house of Giulio Romano, the Palazzo Colloredo, with enormous caryatides supporting its façade; the Palazzo del Té, outside the walls of the town, also built by Giulio Romano, and adorned with some of that master's largest frescoes; the Accademia Virgiliana di Scienze e Belle Arti; the Liceo, the military arsenal, two theatres, one called the Teatro Virgiliano, employed for openair performances in summer, situated in a fine piazza also named after Virgil, and containing a marble pillar surmounted by a bronze bust of the poet, the library, containing 80,000 volumes; the civic and two foundling hospitals; the Monte de Paetà, the principal house of correction for the whole of Lombardy. The manufactures are increasing. The trade is chiefly in the hands of the Jews, who live in a separate quarter. The principal article of trade is silk. There are machine works, oil and flour mills, tanneries and breweries; there is also a considerable trade in timber, which is floated down the Mincio Mantua was an ancient Etruscan settlement, and in the time of Virgil, a native of the region, was a Roman town. Charlemagne built its first fortifications Soon after 1115 Mantua succeeded in making itself independent, and continued so till 1276, when it fell under the iron rule of Buonacolsi or Bonacossi. In 1328 it found better masters in the Gonzagas, who, first as captains, then (from 1432), as marquises, and finally (from 1530) as dukes of Mantua, governed it with great ability, and distinguished themselves by the splendor of their court and their patronage of literature and art. The last of the Gonzaga family who reigned in Mantua was Ferdinando Carlo, or Carlo IV, who, having taken part with the French in the War of Succession, was declared to have incurred a forfeiture by withdrawing his allegiance from his liege lord the emperor of Germany. The Mantuan territory was accordingly annexed to the Austrian possessions in Lombardy, and the remaining part of Montferral vas assigned to Savoy (1708). The fortifications of the town, previously formidable, were completed and put into their modern form by the Austrians and have been kept up to date by the Italian government. In 1706 Napoleon, apparently hopeless of reducing it by any other means, contented himself with keeping it under strict blockade, till famine compelled the garrison to capitulate. After the cession of the western part of Lombardy to Sardinia in 1859, Mantua, with what else of Lombardy remained to Austria, was united to Venetia, and with it was given up to Italy in 1866. The area of the department is 903 square miles, and the population (1921) 376,901. The communal population is 40,467.

MANU, mā'noo, the reputed author of the most renowned law-book of the ancient Hindus, and likewise of an ancient Kalpa work on Vedic rites. It is matter, however, of considerable doubt whether both works belong to the same individual, and whether the name Manu, especially in the case of the author of the law-book, was intended to designate a historical personage; for, in several passages of the Vedas (q v), was well as the Mahâbhārata (q v.), Manu is mentioned as the progenitor of the human race; and, in the first chapter of the law-book ascribed to him, he declares himself to have been produced by Virâj, an offspring of the Supreme Being, and to have created all this universe. Hindu mythology knows, moreover, a succession of Manus, each of whom created, in his own period, the world anew after it had period.

ished at the end of a mundane age.

According to theosophy, the Manu is a great Being (though once a man) who governs the earth planet; other Manus govern other planets, while the Logos (q.v.) created the universe. The word Manu is chiefly used with reference to the author of an ancient renowned Hindu lawbook This work is not merely a law-book in the European sense of the word, it is likewise a system of cosmogony; it propounds metaphysical doctrines, teaches the art of government, and, among other things, treats of the state of the soul after death. The chief topics of its 12 books are the following: (1) creation, (2) education and the duties of a pupil, or the first order; (3) marriage and the duties of a householder, or the second order; (4) means of subsistence and private morals; (5) diet, purification and the duties of women; (6) the duties of an anchorite and an ascetic, or the duties of the third and fourth orders; (7) government and the duties of a king and the military caste; (8) judicature and law, private and criminal; (9) continuation of the former and the duties of the commercial and servile castes; (10) mixed castes and the duties of the castes in time of distress; (11) penance and expiation; (12) transmigration and final beatitude.

Buhler has proved that Max Müller was right in regarding the extant work as a versified recast of an ancient law-book, the manual of a particular Vedic school, the Mânavas; and holds that the work, the date of which used to be given at 1200 B.C., was certainly extant in the 2d century AD, and seems to have been composed between that date and the 2d century BC. There are many remarkable correspondences between this work and the Mahâbhârata, suggesting the use in both of common materials.

MANUAL ACTS, in ecclesiastical and Chur I. In sory, also performed by the hands of the matched the mass, chiefly the fraction of the host, and making the sign of the Cross over at there is a sucration. Both were objected to at the Reformation.

MANUAL ALPHABET, the deaf and dum a a rhad ct; the letters made by deaf and dum's persons with their fingers.

MANUAL BLOCKING. See BLOCK SIGNAL SYSTEM.

MANUAL TRAINING. As an educational term, manual training includes all handwork used as a means in general education. It differs fr m trade education through the apprenticeship system in that it emphasizes the educational element rather than the commercial or industrial element. This "hand-training," however, differs from education in its broader meaning, in that it emphasizes manual skill, and makes such by-products as judgment, accuracy, halits of observation, language, etc, more or less important incidents in the results to be attained. The more recent development of vocational training has tended to cast doubt upon the validity of manual training as a part of education, while the advocates of the traditional features of education-literature, history, mathematics, science, philosophy,—have never admitted it to a place in their educational scheme. The term has therefore become restricted to those forms of handwork which are used as agencies in general education as distinct from vocational, trade and industrial education. The manual training advocates continue to hold that habits of accuracy, judgment and observation and sincerity, formed through manual activities, will contribute to these same mental habits as permanent life characteristics In this they return under peculiar circumstances to the doctrine of formal discipline, approaching the matter in reverse order from the early devotees to this doctrine. Nevertheless it is on this theory that manual training is now holding its place in American public education. When it surrenders this position it must become prevoca-

tional or vocational training.

History of Manual Training.—Finland holds the honor of the earliest use of handwork as an agency in education. Between 1858 and 1866 a plan was developed for teaching handwork in the primary schools, and for training handwork teachers for the public schools.

Sweden established handwork as a part of its educational system in 1872. This included carpentry, wood-turning, wood-carving, coopers' work, book-binding, etc., activities selected from the Hus Slöjd occupations from which we have the well-known "Sloyd Work." Sweden was concerned with the physical health of its people as well as the passing of the old system of house industries. It was hoped that this manual work would invigorate the physical and moral health of the people who lived under artificial city conditions; and that industry would be stimulated by a wide diffusion of manual skill. The Swedish nation has now made handwork an integral part of its public school program and has thus laid a broad and sure foundation for the excellent technical and trade schools above.

France adopted handwork in 1873 in the Ecole Salicis, and in 1882 made such work compulsory in all elementary schools. From its

very beginning drawing has been emphasized and mathematics has been a closely related subject. Because of this academic work the French have drawn the regular teacher into the handwork movement side by side with a trade teacher who gives the practical work. This relationship between the academic teacher and the trade-teacher has been adopted by other countries and has apparently proved its usefulness. England opened its first handwork classes.

England opened its first handwork classes in 1886 and to-day all the large centres of population require such work in their schools. The government awards special financial grants to municipalities who give manual training to boys

and girls of 11 years and older

Germany has long emphasized manual instruction for the artisan classes in her population but her emphasis has been on trade or vocational features. Skill of hand has been the purpose, rather than such moral qualities as were sought, for example, by the Swedish system. As a consequence Germany developed trade and occupation schools, rather than manual training courses in the "real-schulen." The Gymnasia of course give no training in handwork. In fact, there has been no general scheme adopted by any considerable portion of Germany. This is probably due to the fact that trade and occupational training were efficiently carried on. Recently, since 1887, some schools have adopted typical manual training courses, and the Manual Training Seminary at Leipzig is the principal source of manual training teach

ers within the Empire.

Manual training in the United States has depended on private and local initiative. There had been no national movement prior to 1917. The Ethical Culture Society of New York City made the first step by opening handwork classes for small children in 1878 in connection with its workingmen's school. This was followed in 1880 by Washington University, Saint Lous, Mo, under the direction of Calvin A. Woodward This experiment consisted of a fully equipped manual training high school with a variety of shopwork in wood and metal, mechanical drawing, and in such appropriate academic work as science and mathematics. It was a pioneer school and its success was noticed by many of the large American municipalities had majority of American municipalities had manual training. Work many of the large American cities. By 1900 a adopted some form of manual training. for girls as well as boys was included in the program. The courses for girls included sewing, dressmaking, millinery, burnt wood, leather and art jewelry; for boys it included joinery, wood-turning. wood-turning, pattern-making, forging, ma-chine-shop, foundry, sheet-metal, printing, elec-tric wiring, etc. In the elementary school hand-work has likewise found a large place on the program, beginning in the kindergarten and continuing through the elementary grades. The activities include paper folding and paper cutting, basketry, clay-modeling, wood-carving, raffia work, etc Correlation with drawing is more and more the rule. The best practice in the public schools now relates drawing to the experiences of the child. Design is the basis of the work and the design of the drawingclass frequently becomes the project of the handwork-class in the upper grades. Manual training in the American high school early developed into a distinctive institution. Its hand-work or shop-work program is only remotely related to industry The projects are often impractical because they are chosen, not because of their utility or industrial significance but because they illustrate fundamental processes of injustry. Type constructions are used as analytical studies of various manufacturing processes. A complete product is not sought nor are such elements as time, commercial value and shop atmosphere made a part of the instruction The purpose of this typical Manual Training High School is vaguely educational, remotely industrial. As such, it fails to meet the needs

of many industrial communities.

The Vocational Motive.—A change of sentiment became apparent immediately after the Saint Louis Exposition of 1904. Educators who had investigated the subject in Europe and America, who saw the display of the nations' handwork, seemed to feel the need of training that related more closely to life motives. Manufacturers demanded industrial efficiency and appeared to have no confidence in the vague results of the typical Manual Training High School which was a traditional school with shop A demand arose for "shops with facilities schools attached" or with school facilities. Manual training was soon modified so as to add the vocational appeal to boys and girls of 14 years of age and upward The handwork of the seventh and eighth grades has come to be known as "prevocational" in the sense that the processes of many vocations are taught with the purpose of giving the child an opportunity to choose wisely with the aid of vocational advisers among teachers, parents and industrial or vocational experts. The logical step to follow this tional experts. The logical step to follow this "prevocational" work is the trade school so that the advance of the vocational and industrial motives makes the old manual training ideal recede

Industrial Education and Manual Training.—Industrial education is a more comprehensive term than manual training. It includes all that was at first expected from manual training as a stimulus to efficient workmanship; all that vocational and "prevocational" training propose; all that trade education seeks to secure. The emphasis is now on training and the specialized education pertaining to special industries, while the vague educational results of manual training which it was claimed would come by transfer of faculties, drop below the horizon.

Appreciation of the value of vocational education from the national standpoint was shown by the passage by Congress in 1914 of the Smith-Lever Bill, and in 1917 of the Smith-Hughes Bill. The former provided Federal co-operation with the States, chiefly along agricultural lines, while the former created a Federal Board of Vocational Education, and also provided for cooperation with the States in all branches of vocational training. After the World War the Federal Government provided, on a gigantic scale, facilities for vocational training for all honorably discharged soldiers who wished to take it. Up to 1 Nov. 1926, 179,674 veterans had take it. Up to 1 Nov. 1926, 179,674 veterans had take it. Education, Industrial, Education, Technical; Vocational Education, Education, Education, Education, Education

A. R. Brubacher, Late President, State College for Teachers, Albany, N. Y. MANUCODIA, mān-u-co-dī-a, in ornithology, a group of birds either belonging or closely allied to the *Paradiseida*, and peculiar to the Papuan sub-region. The plumage is glossy steel-blue; the outer and middle toes are united for some distance, and there is an extraordinary convolution of the trachea in the malcs, to which the loud and clear voice of the birds is owing. Mr. Sharpe divides the Manucodia into two genera: Phonygama and Manucodia proper, of which four species are admitted—*Manucodia chalybeata (chalybea)*, from the northwest, and *M. comriei*, from the southwest, of New Guinea; *M. atra*, widely distributed over the Papuan sub-region, and *M. jobiensis*, peculiar to the island whence it derives its specific name

MANUEL I, Comnenus, man'ū-ĕl kŏm-nē'nŭs, a Byzantine emperor: b about 1120; succeeded his father, Joannes II, in 1143, died in 1180. The valor which he had displayed against the Turks induced his father to bequeath the crown to him rather than to his elder brother Isaac, who was immediately imprisoned by Axuch, the minister of the deceased emperor. Returning from his campaign in Cilicia, Manuel was received with enthusiasm at Constantinople, but was at once involved in wars both in the East and the West, which lasted with brief intermissions through his reign. In 1144 he subjected Raymond, the rebellious Latin prince of Antioch In 1145 he defeated the sultan of Iconium in successive pitched battles In 1147 he promised his aid to the new crusade headed by Louis VII of France and Conrad III of Germany, and though he allowed them a passage through his dominions he gave secret information to the Turks.

In 1148 he began the most important war of his reign with Roger, the Norman king of Sicily, who had taken Corfu and prepared to invade Greece. He formed an alliance with the Venetians, who within a year joined him before the fortress of Corfu, which was surrendered after an obstinate siege. He was prevented from invading Sicily by hostilities of the Serbians and Hungarians, instigated by Roger, the former of whom were vanquished in two campaigns, but the latter protracted the war till 1152. In that year he suffered a reverse from the Turks in Cilicia, but his general, John Ducas, gained so great successes in southern Italy that Manuel conceived the project of reuniting the eastern and western empires

The defeat of Alexis, the successor of John Ducas, by William, the successor of Roger, soon followed, the Sicilian admiral Maius routed the Greek fleet off Negropont, and advanced toward Constantinople; and Manuel therefore accepted an honorable peace in 1155 Those Greek prisoners who were silk-weavers were retained in Italy, and gave origin to the flourishing Italian silk manufactures In the following years he waged successful wars with Raymond, Prince of Antioch, and Az-ed-din, the Turkish sultan. A new war soon broke out with Gejza, king of Hungary, which was terminated by a disastrous defeat of the Hungarians near the present Semlin. In 1176 he experienced a terrible defeat from Az-ed-din in the mountains of Pisidia, and was obliged to sign a disadvantageous peace. By breaking the treaty and renewing the war he

in a nell horomy to terms. This truke his health unlike like in a slev facer.

MANUEL II, Palæologus, på-lö-öl'ö-güs, a hand die ergir ratter 1851, succeeded his factor, James V in 1801 died in 1425. At the deal of the factor has a lister to the red from the court of the salest factor. When he had been left as a lister I he of insequence was a war with bagaren, in which Matthe was supported by an ergy of Hurgarias, Germans and French The atlast that it the command of Sigismund, king of Hurgarias, Germans and French The atlast that it the command of Sigismund, king of Hurgarias, and afterward emperor of termany, were defected at Nicopolis in 1396, which has of 19400 men. Constantinople was besteged, and its fall second impending, when the conguests of Tamerlane diverted the arms of the salian. Manual visited Italy, France and Germany, vainly seclaring assistance from the Western princes. In the conflict between the Tartars and the Turks, he acted with diplomatic skul, and secured peace to his empire. He sent ambassadors to the Council of Constance with instructions to urge a union of the Lain and Greek charches; but his real object was only to obtain aid from the kingdoms of the West, and to alarm the Turks by the negotiations with those kingdoms.

MANUEL II, ex-king of Portugal, younger son of Carlos I: b Lisbon, 15 Nov 1889. He was known as the Duke of Boja and scandalous reports of his life in Paris were circulated before it was thought he would succeed to the throne. Consequently his accession on the asassination of his father and the Crown Prince on 1 Feb. 1908 was not the occasion of great popular rejoicing. He took the oath as king on 6 May 1908. His private life continued to alienate the affection of the people and on 5 Oct. 1910 the Republicans overturned his throne and proclaimed a republic. Manuel fled to England where he resided at Twickenham with his uncle, the Duke of Orleans From there in 1911 he directed uprisings in Portugal with the object of abolishing the republic. These proved unsuccessful as did others in succeeding years and the entrance of Portugal into the war of 1914-18 as a member of the Entente appeared to put an end definitely to Royalist uprisings in that country despite huge sums spent by the Germans in propaganda to that end. Manuel married Princess Augustine Victoria of Hohen-zollern-Sigmaringen in 1913; the union proved unhappy and a separation resulted. D. 2 July 1932

MANUEL, Don Juan, Spanish prince and author: b Escalona, Spain, 5 May 1282; d. 1349. He was a nephew of Alfonso X, and cousin of Sancho IV. His public life was a restless and turbulent one, but his chief claim to remembrance comes from the fact that he was one of the first and one of the best of Spanish prose writers. He wrote in a style of Singular simplicity and charm, and few Spanish authors have succeeded so well in giving to their words the calmness, the weight, the richness which come only from long experience and reflection. His principal work that remains is 'Libro de Patronio,' more commonly known as 'El Conde Lucanor,' which has been translated into the French and German languages.

MANUFACTURERS, National Association of, an American association organized in Cincinnati in 1895. It had three primary ob-

jects - increasing the export trade; influence-State and national legislation; and arbitratilabor disputes The Association maintains general office in New York City and issue numerous confidential reports and bulletins for the exclusive use of its members. The Asciation is opposed to all boycotts and blacklet but is not opposed to labor organizations, thous, it has resisted many of their rulings, and popularly considered as antagonistic, because the vigor with which it pushed the now family suit against the American Federation of Lahufor its boycott of the Bucks Stove and Rarut Company This was a long-fought test cast and the manufacturers won, stopping all om. cial boycotting For several years the association directed its attention against the Independent Workers of the World, with considerable success. The Manufacturers' Association has given considerable effort to promoting constructive legislation to aid manufacturers, and has made some gains in patent law, but signally failed in securing better terms from the Post-Office Department It publishes American Industries (monthly), which has 35,000 circulation, and The American Trade Index (monthly).

MANUFACTURES IN THE UNITED STATES. See UNITED STATES, COMMERCIAL AND INDUSTRIAL DEVELOPMENT OF

MANUL, ma'nul, the common wildcat of Siberia and Tibet. It is smaller than the European wildcat, stockily built, has a moderately long tail and a coat of long hair. The general color is yellowish white, with a blackish mark on the chest and upper part of the fore legs, and some dark lines across the haunches and ringing the tail. Two black line on the cheeks and a black spot behind the short ear are other distinguishing marks. There is a very curious similitude of appearance between this animal and the pampas cat of Patagonia.

MANUMISSION, in Roman law, the solemn ceremony by which a slave was emancipated. Constantine the Great allowed the Christian masters to emancipate their slaves before the altar on festival days, and especially at Easter, by placing the deed of emancipation on the head of the freedman in the presence of the congregation. See Emancipation, Emancipation IN LATIN AMERICA; EMANCIPATION PROCLAMATION

MANURES AND MANURING. See AGRICULTURAL CHEMISTRY; FERTILIZERS

MANUSCRIPTS (Latin, manuscriptus, written by the hand), are literally writing of any kind, whether on paper or any other material, in contradistinction to printed matter Previous to the introduction of printing all literature was contained in manuscripts. All the existing ancient manuscripts are written on parchment or on paper. The paper is sometimes Egyptian (prepared from the real papyrus shrub), sometimes cotton or silk paper (charta bombycina), which was invented in the East about the year 706 AD, and used till the introduction of linen paper, and in common with this till the middle of the 14th century; sometimes linen paper, the date of the invention of which, though ascribed to the first half of the 13th century, on the authority of a document of the year 1243, written on such paper, is

nevertheless exceedingly doubtful. The earliest menuon of quill pens is in the 7th century. The most common ink is the black, which is try off. The oldest, however, was not mixed with vitriol, like ours, but generally consisted of soft, lamp-black, burned ivory, pulverized charcial, ctc. Red ink of a dazzling beauty is also found in ancient times in manuscripts. With it were written the initial letters, the first lines, and the titles, which were thence called subrics, and the writer subsector More rarely, but still quite frequently, blue ink is found in ancient manuscripts; yet more rarely green and yellow Gold and silver were also used for writing either whole manuscripts (which, from their costliness, are great rarities), or for adorning the initial letters of books With respect to external form, manuscripts are respect to external form, manuscripts are divided into rolls (volumina, the most ancient way, in which the troubadours in France wrote their poems at a much later period) and into statched books or volumes (properly codices). Among the ancients the writers of manuscripts were mainly freedmen or slaves (scribæ librarii). Some of the professional copyists in Rome were When Origen undertook the revision women of the Old Testament (231 AD), Saint Ambrose sent to his assistance a number of deacons and virgins skilful in caligraphy_ Subsequently the monks, among them the Benedictines in particular, were bound to this employment by the rules of their Order In all the principal monasteries was a scriptorium, in which the scriptor or scribe could pursue his work in quiet, generally assisted by a dictator, who read aloud the text to be copied; the manuscript was then revised by a corrector, and afterward handed to the miniator, who added the ornamental capitals and artistic designs.

It is more difficult to form a correct judgment respecting the age of Greek manuscripts from the character of the writing than it is respecting that of Latin manuscripts. In general it is to be remarked that in a Greek manuscript the strokes are lighter, easier and more flowing the older it is, and that they become stiffer in the progress of time The absence or presence of the Greek accents is in no respect decisive Some Greek papyri are earlier than the Christian era, but most are not earlier than about the 6th century The characters in Latin manuscripts have been classified partly according to their size (majuscula, minuscula), partly according to the various shapes and characters which they assumed among different nations or in various periods (scriptura Romana antiqua, Merovingica, Longobardica, Carolingica, etc., to which has been added since the 12th century the Gothic, so called, which is an artificially pointed and angular character); and for all of those species of writing particular rules have been established, affording the means of estimating the age of a manuscript. Before the 8th century punctuation marks rarely occur: even after the introduction of punctuation, manuscripts may be met with destitute of points, but with the words separate. Manuscripts which have no capital or other divisions are always old. The catch-word, as it is termed, or the repetition of the first word of the following page at the end of the preceding, belongs to the 12th or subsequent centuries. The fewer and easier the abbreviations of a manuscript are the older it is. Finally, in the oldest manuscripts the words commonly join each other without break or separation. The division of words first became general in the 9th century. The form of the Arabic ophers, which are sellom found in manuscripts cacher than the first half of the 13th century, also assists in decling the age of a manuscript. Some manuscripts have at the end a statement when, and commonly also by whom, they were written (dated codices) But this signature often denotes merely the time when the book was composed, or refers merely to a part of the manuscript, or is entirely spurious. The most ancient manuscripts still preserved are those written on papyrus which have been found in Egyptian tombs Next to them in point of age are the Latin manuscripts found at Herculaneum, of which there is a rich col-lection in the Naples Museum Then there are the manuscripts of the imperial era, among which are the Vatican Terence and Septuagint and the Biblical codices in the British Museum. Since the middle of the 19th century many manuscripts of Greek writings have been found in Egypt, among the chief being that containing the orations of Hyperides, several containing parts of the works of Homer, Plato, Demosthenes, etc, that in which occurs a portion of the Antiope of Euripides, and the almost complete text of Aristotle's work on the constitution of Athens. It was the custom in the Middle Ages to obliterate and erase writings on parchment for the purpose of writing on the materials anew, and these manuscripts, many of them of great value, are known as "palimp-This custom ceased in the 14th sests.» century, probably because paper came then more into use. See LIBRARIES; MANUSCRIPTS ILLUM-

INATED; MANUSCRIPTS OF THE BIBLE; PALEOG-RAPHY; PAPYRUS

ANUSCRIPTS, Illuminated, are those whose text is heightened and brightened by vignettes and other decorations in colors, gold and silver. The verb to illuminate first occurs in the beginning of the

18th century; and means to decorate an initial letter, a word, or a text of a manuscript with gold, silver or brilliant colors, or with elaborate tracery, miniature illustrations and designs. The older verb was to enlumine (Old French enluminer; late Latin, inluminare; classic Latin, illuminare). It occurs, A.D. c. 1366, in Chaucer, A.B. C., 73, "Kalendeeres enlumyned ben"; A.D. c. 1400, 'Roman de la Rose,' 1695, "For it so welle was enlomyned"; A.D. 1430, Lydgate, 'Chron. Troy,' Prol, "For he enlumineth by craft and cadence this noble storye with many freshe coloure of Rhetorik." Illumination differs from painting, according to Ruskin, 'Modern Painters' (1856, Vol. III, iv, vin, sec. 9), in that "illumination admits no shadows, but only gradations of pure colour." The earliest writing of many peoples was by means of pictures. Witness the pictographs of Sumeria, that later evolved into Babylonian cuneiform script; the hieroglyphic writing of Egypt; the crude scrawls of our American Indians; and

the Aztec picture-writing, which still defies epigraphists. It was but natural that an art arcse of embellishing these pictographs. Fifteen conturies before Christ the papyrus rolls that contain the ritualistic Book of the Deadwere illuminated with brilliantly colored scenes. In due time the art of illumination passed over to peoples whose script was alphabetic; it always remained an art of beautiful writing. There is truth, though characteristically narrow and dogmatic in expression, in the saying of Ruskin, 'Lectures on Art' (1870, v. 138): "Perfect illumination is only writing made

lovely; the moment it passes into picture making it has lost its dignity and function." I. Illumination in the East. 1. In Egypt. The earliest specimens of illumination are on Egyptian papyrus rolls. Ritual directions are in red; hence the mediæval rubric. Profile portraits are inserted into the text. Agricultural and household scenes are interspersed between hieroglyphic signs. From the Egyptians the art of illumination reached the Hellenic folk of Alexandria A 4th century BC papyrus manuscript of the poems of Timotheus, found at Abusir, has a bird as a punctuation mark. Not until the Christian era do miniatures adorn the text. A 1st century AD Greek papyrus (Bibliothèque Nationale de Paris) shows a text that is adorned with miniatures in bold relief. A Berlin papyrus, Kaiser Friedrich Museum, illustrates the cure of a demoniac by Jesus. While in Hellenic Egypt the art of illumination thus progressed, the Coptic artists carried on a separate tradition from their ancient Egyptian forebears. A Coptic chronicle, dated 392 AD. (Goleniscey collection) has a wealth of miniatures illustrative of the months, the provinces of Asia, the rulers of Rome, Lydia and Macedonia, together with the destruction of the Serapeum under the direction of the patriarch, Theophilus. The Morgan collection of Sahidic manuscripts, of the 9th and 10th centuries, contains a dozen manuscripts with miniatures of the Virgin and her Son, angels, martyrs, saints, hermits; and almost all of the 58 manuscript volumes of this remarkable Coptic library are illuminated with marginal dec-

orative schemes of animals and plants

2. In Syria.—The monks of Syria show the traditions of the Semitic orient in the illumination of manuscripts. Saint Augustine, 'Adv. Faustum' (xiii, 6, 18), refers to the miniature illustration of Persian parchments From the 5th century, there were monastic schools for illumination in Mesopotamia and Syria. The Syriac Evangeliary, 586 A.D., the work of Rabbula at Zagba in Mesopotamia, now in the Laurentian Library, Florence, is an exquisite work of art; the miniatures represent the Crucifixion, etc.; the marginal schemes are geometrical, and contain flowers, birds, etc. Some Hellenistic influence is noticeable; but Semitic traditions dominate in the Syriac school of illuminating. To this school belong also the extant Armenian illuminated manuscripts. Three evangeliaries, books of pericopic readings from the Epistles and Gospels, show the most beautiful work of Armenian miniaturists: that of Etschmiadzin, 10th century, copied from a 6th century model; that of Queen Mike, 902 A.D., Monastery of the Mechtarists, Venice; and the Tübingen Evangeliary, 1113 A.D. Mohammedan illumination copied Syriac in many Arabic, Turkish

and Persian manuscripts, chiefly of the Quran. The decorative work is often rich in its red blue and gold cufic characters

3. The Byzantine School.— In the Hellenistic speaking parts of the Byzantine Empire, the traditions of ancient Greece held sway; although iconoclasm interfered for a while with the progress of miniature painting and Syriac influences were strong. Previous to the destructive vandalism of the iconoclasts, Byzantine miniaturists beautified the great 6th century purple parchment, Biblical codices: L. Vienna Genesis, silver letters; N. Cod Purpureus, silver letters, Gospels, most of manuscript at Petrograd; Z. Cod. Rossanensis, silver letters, Matthew and Mark, at Rossano, in Calabria; Zb, Cod. Sinopensis, gold letters, Matthew, in the Bibliothèque Nationale de Paris; P. Cod Beratmus, Matthew and Mark, at Berat, Albania These illuminated manuscripts contain Biblical scenes, the bearded face of the Christ, etc.—all in miniature. To this period of Byzantine illumination belongs the 'Roll of Joshua,' 11 yards long, at the Vatican, which pictures the story of the great leader; and the manuscript of Dioscorides, at Vienna, 472 a D, containing portraits of physicians that were copied from originals. All this early Byzantine illumination was along broad lines, free from stereotyped forms,—save the hieratic and fixed faces,—classic in artistic merit, brilliant in coloring, and profusely decorated with gold.

Iconoclasm during the 8th and 9th centuries wrought havoc to the art of illumination in the Byzantine Empire. Precious manuscripts were recklessly destroyed or ruthlessly mutilated. The artists of the iconoclastic period substituted ornamentation for miniature; flora, fauna and geometric forms for figure-painting. An instance of their work is the 'Evangeliary' at Bibliothèque Nationale de Paris, Gr 631. The triumph of image-worship, 842 AD, brought about a return to the painting of figures. The 10th to the 12th centuries were the most glorious period of Byzantine miniaturists About 40 years after the restoration of image-worshin, the 'Sermons of Saint Gregory of Nazianzen' (Bibliothèque Nationale de Paris, Gr. 510), 880 c. A.D., were executed, and embellished by a series of large, beautiful miniatures. The 'Paris Psalter,' dating from the 10th century (Pibliothèque Nationale de Paris Gr. 130) has (Bibliothèque Nationale de Paris, Gr. 139), has scenes of the life of David, reproduced from 3d or 4th century models, that vie with the frescoes of Pompeii in freshness and brilliancy. The 'Homilies of Saint John Chrysostom,' Paris, a manuscript which belonged to Nicephorus III (1078-81 AD) is likewise a good example of Byzantine illumination at its maturity. The Psalter and the Menologion, a brief sketch of the lives of the saints for each day, were at this time most frequently decorated. The 'Vatican Psalter' (1059 A.D.), in the Barberini Library; and the Menologion of Basil II (976-1025 AD) in the Vatican, are rich in miniatures of brilliant coloring. Here should be mentioned the Slavic school of illumination. It was Byzantine at first; and gave us the 'Chloudov Psalter,' 9th century, at Moscow. Between the 12th and 16th centuries a national Between the 12th and 16th centuries, a national style appeared, which is characteristic of many of the numerous and richly illumined manuscripts of the libraries and museums of Petrograd and Moscow,

MANUSCRIPTS, ILLUMINATED



Letter S illuminated. Italian (Verona). Early 15th century



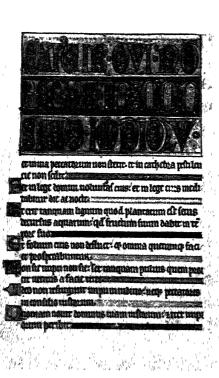
Courtesy, The Metropolitan Museum of Art Letter Milliuminated Italian. 14th century.

MANUSCRIPTS, ILLUMINATED





Two leaves from antiphonary Italian 15th c ntu-y





Courtesy, The Metropolitan Museum of Art Letter D illuminated. French. 15th century.

First page of Psalter. French. 13th century

II. Illumination in the West. 1. Early Italian.—As manuscript writing, so illumination began in the East, and was thence taken over by the West Pliny, 'Historia Naturalis' (xxx, 8) is witness to minature-painting in Heme during the 1st century BC Martial (xix, 1865) speaks of a parchment containing a portrait of Virgil Varro had some 700 such minature portraits. The most ancient illuminated manuscripts probably of western provenance are, the fragmentary 'Iliad,' 3d century, Ambrosian Library, Milan; the Vatican Virgil, the 'Schedæ Vaticanæ,' 4th century, Vat Lat 3225, with 50 miniatures; the 'Codex Romanus,' another Vatican Virgil Here be it noted that Latin illuminators gave us the word miniature,—from the Latin miniam, which means red lead or cinnabar,—the vivid-red lead oxide used as a pigment. Hence also is minate, to paint in miniature; together with miniator, the miniature-painter. Early Italian illumination is not very well known to the historian of art. Byzantine art reacted on Italian, and this reaction is marked in mosaics, early Italian painting, and the earliest illumination of manuscripts in southern and central Italy Through Italy, the East influenced the illumirators of the Frankish Empire.

2. Celtic Illumination.— It was during this period of decline of illumination in the West that the Irish school, as early as the 7th century, broke completely away from the copying of ancient models and mangurated its own style of book-ornamentation. The individuality of the artists, the civilization and character of their race, were expressed in an art that reached the very height of perfection and made its influence felt in continental Europe. The Celtic initials, margins, and full-page designs are easily recognized by their great intricacy of interlacing spirals, zigzags, and ribbons, that entangle animal and human shaped fancies, knots, and other designs,—all executed with a marvelous precision of mathematical accuracy, graceful delineation, delicate touch, brilliant coloring, and most fecund imaginabrilliant coloring, and most recund imagina-tion Irish illumination is decidedly orien-tal in conception and execution; and seems to point back to the ancient civilization of the race, before the Celtic migration from the steppes of Asia, across Asia Minor, by way of Austria, Switzerland, Spain and France. No trace is found of classic influ-ences. Foliage is absent. Kinship with the sculpture on stone and jewels in harbaric Iresculpture on stone and jewels in barbaric Ireland is marked The wonderful decorative schemes are more like to the Arabic than to any other; and the human form is depicted with a geometrical symmetry that is characteristic of Coptic workmanship. The finest example of Celtic illumination is in Q, 'Codex Kenanensis,' the Book of Kells, 8th century, Vulgate Gospels, in Trinity College, Dublin. Its pages are replete with brilliant, exquisite designs, testifying to a minuteness and delicacy of precision that are a marvel to art critics. The Celtic art of illumination reached Iona through Saint Columba's foundation there; and the monks of Iona (635 AD) brought their faith and their art to Lindisfarne, or Holy Isle, off the Northumbrian coast. Here was executed in Celtic style the 'Lindisfarne Gospels' 8th century now in the Cottonian college. pels,' 8th century, now in the Cottonian collec-tion of the British Museum. Other fine works

of the Celtic school of illuminators are the 'Book of Deir'; A, Codex Sangallensis, 9th or 10th century, Gospels in Greek and Latin, at Saint Gall, Switzerland In England, the Celtic school of illumination dominated, although manuscripts brought by Saint Augustine from Rome introduced a classic influence. The 'Utrecht Psalter' (800 AD) is representative of the Celtic style in transition. It shows crude attempts at drapery effects. In Anglo-Saxon miniatures, frames of foliage and fluttering draperies become characteristic. The 'Benedictionale' of the see of Devonshire is the most elaborate specimen of 10th century Anglo-Saxon miniatures. The Norman Conquest saved Anglo-Saxon illumination from the fantastic exaggerations into which it was sinking

3. Carlovingian Illumination.—When Charlemagne became emperor of the West (800 AD) illumination was rapidly revived. The Celtic style provided to this new school its interlacements; Byzantine art was drawn upon for the painting of the human figure Gold was used profusely in letters as well as illustrations. Large initials were almost the rule. Orna-Large initials were almost the rule. Ornamentation was luxurious. Miniatures represented historical characters, symbolical themes, the arts, signs of the zodiac, virtues, vices, etc. Notwithstanding the gorganic affect of the control of the contr Notwithstanding the gorgeous effect of purple vellum, a dazzling abundance of gold, and a brilliance of decoration, the Carlovingian illuminated manuscripts show a tendency to coarseness of workmanship and clumsiness of figureness of workmansnip and cumsiness of ngure-painting. This tendency is in part offset by the purer style of the Celtic influence. The best examples of early Carlovingian illumination are: the 'Evangeliary,' said to have been illumi-nated by Godescale for Charlemagne in 787 A.D., whose text is in gold letters on a purple ground, and whose every page is illustrated with a difand whose every page is illustrated with a different decorative scheme; another 'Evangeliary' of Charlemagne, at Vienna; the 'Bible of Theodulf,' bishop of Orleans, at Paris and Le Puy; the 'Sacramentary,' written for Drogon, son of Charlemagne and bishop of Metz; the 'Evangeliary of Lothair,' Paris; and the 'Bible of Charles the Bald,' presented by Count Vivien, abbott of Saint Martin of Tours. It was about the time of Charles the Bald second half of the 9th century that Carlon Bald, second half of the 9th century, that Carlovingian illumination reached its greatest perfection.

4. Gothic Illumination.—The 10th to the 12th centuries show a decadence of Frankish illumination. After the 'Regensburg Gospels' (11th century) miniatures become more coarse and clumsy, colors are dull. Toward the end of the 12th century, a renascence of illumination is visible in both Germany and France Gold is now laid on in leaf, and not in liquid: burnishing makes the illumination most brilliant. The old illuminators were monks; now laymen take up the art. The initials are smaller, but more artistic; they often contain miniatures of illustration or interpretation of the Biblical text Hundreds of miniatures beautify the 'Picture Bibles' of the 13th century, or interpret the 'Sermon Bibles' of the period. Gothic features are introduced,—gables, pinnacles, rose and quatrefoil decorations. The human figure is painted with realism; 13th century costumes are preserved to us in an accuracy of coloring. During the 14th century, there is a departure

from non-centional friliage, and a reproduction of a child is and to were from nature. And with the control are internancied peasants, birds, a mess internation, etc.—all true to life. The interpretary of Belleville, (Bibliotheque Nation-Briviary of Belleville, Bibliotheque Nationale de Paris, Lat 10483-4) the work of the national Parish. Influentiator, Jean Pucelle, together with Malrott Ancelet and J. Chevrier; the Book of the Miracles of Our Lady, Sissing Licen Mirry Psalter (British Museum), done for Mary Tudor, are all exquisite works of 14th century craft. The golden also is illumination continues during the early 15th century. Even at the outset of the Blook of Hours are the special feature. Such is the Tres Riches Heures' of the Duke of Borry, Musee Cordé, Chantilly, by Pol de Lindaury, containing miniatures of the various chatcaux of the duke, and portraying marvelous Charaum of the duke, and portraying marvelous again perspectives in landscape scenery,—the errects of snow, starlight, blazing sunlight and dull autumn shades. Other beautiful Hora are the 'Grandes Heures,' by Jacquemart de He-din; 'Très Belles Heures,' and 'Heures de Turin, of the same Flemish school; and the 'Hours of Anne of Brittany' (1508 AD). This last work marks the end of the art of illumination. The Renaissance, together with the invention of printing, were fatal to miniature painting of books, and to the illumination of their confully written pages. of their carefully written pages.

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MANUSCRIPTS OF THE BIBLE are written as opposed to printed copies of the whole Bible or a part thereof. All these manuscripts, whether of the original text or of an ancient version, so long as they were done before the invention of the art of printing, are important in the science of the textual criticism of Holy Writ. This article will contain a brief introduction on Bible manuscripts in general, followed by a summary account of the chief Hebrew, Greek, Latin, Syriac, Armenian and Coptic manuscripts of the Bible. Manuscripts of the Arabic, Ethiopic, Slavic and other early versions of Scripture do not witness to the ear-hest type of New Testament text; they are amply treated in technical dictionaries of the Bible.

I. Bible Manuscripts in General.—There are three classes of Bible manuscripts - papyrus, vellum and palimpsest - to which attention

should be called

1. Papyrus 'Manuscripts.- While Babylonian scribes were impressing upon endurable clay the cuneiform, or wedge-shaped, ideo-graphic records of the style, Egyptian reedwriting with ink upon papyrus developed almost at the same pace. The name of this primitive paper is that of the plant which provided its raw material. The papyrus, πάπυρος, probably an Egyptian loan-word,- was a rush of thak

triangular stalk. Its main root, Theophrastus tells us, wa about 15 feet long and as thick as a man's wri-Likely the bullrush, gómér, the wicker out which was plaited the ark that contained the in fant Moses, was the Nile papyrus The culecoat of this Egyptian water-plant was peeled are the pith was cut into strips and these werglued together transversely to form the first known writing paper Sheets of papyrus were very fragile, became brittle in air, crumbled with use, could not resist the disintegrating force or moisture and were quite impracticable i. book-form Hence all papyrus manuscrip, have been lost to us, save such as were buried in the exceedingly dry soil of Upper and Middle Egypt. For many years, the ignorar féllahin wantonly destroyed these precious re-ords of the past. Now scientific excavators are preventing this ruthlessness, and constantly adding to the world's various collections of papyrus manuscripts. The most ancient papyrus document is a record of the reign of the Egyptian King Assa, BC. 3580-3536; and the earliest lit erary papyrus work extant is the Prisse papyrus of Paris, written in the 5th dynasty, c B c 2500 During the first three centuries of Christianin papyrus was the ordinary writing paper of the Roman Empire. It was used by the Arabs unul the 8th century, when modern paper was invented. The sacred writers or their scribe most likely used ink and rolls of fragile papyrus for the autographa of the New Testament (2 Connthians ii, 8, 2 John, xii). These precious documents seem to have perished during the early 2d century. No trace of them is found in the writings of either the Apostolic or Apolegetic Fathers,—unless we except Tertullian's words, "the authentic letters of the Apostles themselves," which are now generally set aside as rhetorical.

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non-literary sources' (parts 1 and 2, 1914-15).
2. Vellum Manuscripts.—Pliny ('Historia Naturalis' xiii, 1) is witness to the use of yellum for documentary purpose before the time of Christ. Saint Paul (2 Timothy iv, 13) employed both papyrus-rolls, τὰβιβλία, and parcharter a ment, μεμβράνας. In the 3d century, vellum began, outside of Egypt, to supersede papyrus; and in the early 4th century, the codex or parchment book-form gained complete victory over the papyrus-roll. To this century belong the earliest extant Bible manuscripts of any thing but fragmentary size.

3. Palimpsests - Some of our most important vellum manuscripts are palimpsests (-Lat. palimosestum, παλιμψηστός «scraped again» i e., manuscripts that were scraped a second time with pumice-stone and written upon anew). The reckless charge of wholesale de-struction of Biblical manuscripts by the monastic scribes of palimpsest works has not been substantiated. Wattenbach ('Das Schriftwese im Mittelalter,') 1896, pp. 299 ff), a leading authority on the subject, notes that a Greek synod, A.D. 691, forbade the use of any but utterly unserviceable Biblical or Patristic manuscripts for palimpsest-writing According to Wattenbach, "more precious manuscripts, in proportion to the existing supply, have been destroyed by the learned experimenters of our time than by the much abused monks of old." The deciphering of a palimpsest may at times to accomplished by merely soaking it in clear water. The "learned experimenters" use some chemical reagent, in order to bring back the original writing Such chemical reagents are an infusion of nutgalls, Gioberti's tincture and hydrosulphuret of ammonia; all do harm to the manuscripts

II. Hebrew Manuscripts.— Certain parts of the Hebrew Bible,— Daniel ii, 4b-vii, 28, and Ezra iv, 8-vi, 18, together with vii, 12-26,— are not in Hebrew, but in Aramaic. These Biblical Aramaic portions, in the language that the exiled Jews adopted during their Babylonian captivity (BC. 586-536), are here treated conjointly with the Hebrew text into which they have been received We shall briefly sum up the age, number and worth of the Hebrew man-

uscripts of the Bible

1° Age — Textual criticism divides the Hebrew text of the Bible into the Masoretic and

pre-Masoretic.

The Masoretic text is that of our complete Hebrew manuscripts. It represents the Masorah This authoritative textual tradition was begun in the 1st century BC; was fixed in its consonantal readings during the Talmudic peconsonantal readings during the faimudic period (AD 300-500); and received the vowel points about the 8th century of our era. The pre-Masoretic text includes chiefly the readings that are not witnessed to by Masorah. The earliest manuscript of the Hebrew Bible, and probably the oldest extant Biblical manuscript, is the Nach property. There are four from is the Nash papyrus. There are four frag-ments, which, when pieced together, give 24 lines of a pre-Masoretic text of the 10 commandments and of the shemá (Exod. xx, 2-17, Deut v, 6-19, and vi, 4-5). The writing is without vowels, and seems paleographically to belong to not later than the 2d century. Another witness to the pre-Masoretic text is the Samaritan Pentateuch, which is probably pre-exilic in origin. The earliest Samaritan manuscript extant is that of Nablus, once rated very ancient and now assigned to the 12th or the 13th century. The newly-discovered Hebrew 'Ecclesusticus, represented by fragmentary manuscripts of the 10th or 11th century, preserves parts of the pre-Masoretic text of a book until recently thought to have been written in Hel-

All other Hebrew manuscripts of the Bible are Masoretic, and belong to the 10th century or later. At most 9 or 10 are earlier than the 12th century. The earliest are Codex Petropolitanus, dated AD 916; the Saint Petersburg Bible, dated AD 1009; and Codex Oriental, 4445, British Museum, which Ginsburg assigns to AD 820-850.

2°. Number.— Kennicott ('Dissertatio Generalis in Vetus Testamentum Hebraicum,' 1780), collated 16 Samaritan and 638 Masoretic manuscripts. De Ross; ('Variæ Lectiones,' 1784), brought the number of Masoretic manuscripts up to 1,375. No one has since surpassed this critical work of De Rossi on the Masoretic text. Some 2,000 Masoretic manuscripts gathered in the Crimea by Firkowitsch,

await critical study in the Imperial Library of Petrograd Consult Strack, 'Die hiblischen und massoretischen Handschriften zu Tschufut-Kale' (In Zeits. für luth Theol und Kirche, 1875)

3°. Worth — This rich store of some 3,375 manuscripts promises no very important critical results. For they all depend on an archetype of the 2d century AD, and are singularly alike in accuracy of reproduction. The Masoretes were most detailed in their painstaking efforts to hand down the text of this archetype. The Scribes counted words and consonants of each book; noted the middle words and middle consonants; retained peculiarities of script,—such as broken letters, inversions, consonants that were too small or too large, dots out of place, etc. All these oddities were handed down as God intended, and received mystical interpretations. Here is an instance. In Genesis it, 4, behibbare ām, "when they were created," the letter h is unduly small. The rabbis handed down this peculiarity as God inspired; translated the word, "In the letter h he created them"; and then disputed what that meant. Hence the importance of manuscripts of the early versions of the Old Testament, so

as to reach a pre-Masoretic text.

Bibliography.—Kraft and Deutsch, 'Die handschriftl hehraischen Werke der k. k. Hofbibliothek' (1857); Strack and Harkavy, 'Catalog der hebr Bibelhandschriften der kaiserlichen Bibliothek' (1875); Schiller-Szinessy, 'Catalogue of the Hebrew Manuscripts' (preserved in the University Library, 1876) Assemani, 'Bibliothecæ Apostolicæ Vaucanæ Codices Orientales' (1756); Mai, 'Appendix to Assemani' (1831); Neubauer, 'Facsimiles of Hebrew Manuscripts' in the Bodleian Library (1886), and 'Catalogue of the Hebrew Manuscripts' in the Bodleian Library and in the

College Libraries of Oxford (1886). III. Greek Manuscripts.— Textual critics divide Greek manuscripts of the Bible into uncials and minuscules. Uncial manuscripts are written in large disconnected letters that vary in force so as to indicate the time and place of provenance. Words are not separated; accents and punctuation marks are not used; no great variety of script is admitted; ligatures are employed for the most ordinary words; paragraphs are marked off by small lacunas. The decadence of elegant uncial writing begins in the 6th century; twists and turns are given to certain letters. In the 7th century manuscripts still greater freedom of flourish is allowed the scribe; accents and breathings are introduced, and the script leans to the right. By the 10th century the writing in Biblical manuscripts begins to be more or less cursive; these manuscripts are called minuscules. The letters are now small, connected and written with a running hand. Cursive writing holds sway in Biblical manuscripts until the 16th century. In AD. 1514, the Greek New Testament was for the first time printed.

1°. Old Testament Greek Manuscripts— Traces of the version of Aquila (c. A.D 130) are found in: (1) fragments of Origen's third columns, written as marginal notes to some manuscripts of the Septuagint; (2) the Milan palimpsest of the Hexapla, a 10th century copy found by Mercati in 1896, containing about 11 psalms; (3) the Cambridge fragment,

7th certury, giving parts of Psalm xxi—Ci Taylor, (Cairo Gerizah Pal mpsests) (1966, 14) the Cairo fracments of the 4th and (19.6), (4) the Caro frarments of the 4th and 5th senseries: three palimpsets (containing 1 Kings ax, 7-17, 2 Kings v.c.m, 11-27), published it Burkitt at 18/7; also four portions of the Psalms (89-17-91-10, 95-7-96-12, 98-3, 161-16-192-13) published by Taylor (opent); (5) the 4th century papyrus fragments of Geresis 1, 1-5, published by Grenfell and Huntin 19/6). Our few manuscript traces of the versions, which Symmachus and Theodotion issued toward the end of the 2d century, may be found in the same Hexaplanic fragments that witness to the text of Aquila. Theodotion's Daniel is preserved in the Septuagint manuscripts

The Septuagint version of the Old Testament is extant in many manuscripts. These represent three textual families,—the Hexaplaric, Hesychian and Lucianic. The Hexaplaric hesychian and Lucianic. ric text takes its name from the Hexapla of Origen This colossal critical work, completed c. AD. 240, presented in six columns the Hebrew text, the Greek transliteration thereof, Aquila, Symmachus, the Septuagint and Theodotion; symmachus, the Septuagint and Theodotion; and, for certain books, two other Greek translations that are named Quinta and Sexta Pamphilus, a disciple of Origen, preserved manuscripts of the Hexapla at Cæsarea. In the 4th century, Pamphilus and his disciple, Eusehius of Cæsarea reproduced the fifth administration. bius of Cæsarea, reproduced the fifth column,— i.e., Origen's Hexaplaric Septuagint text,— together with all its critical signs By these critical signs, Origen had marked off passages, which he had found wanting in the Septuagint and had supplied from either Aquila or Theodotion. Unfortunately the scribes were not faithful in handing down the critical signs of Origen In this wise the Cæsarean text of the Septuagint was evolved into a hopeless commingling of Origen's Septuagint together with his interpo-lations from Aquila and Theodotton. Meantime two other editions of the Septuagint got a vogue,—those of Hesychius at Alexandria and of Lucian at Antioch. From these three editions of the Septuagint text, all of our extant manuscripts are descended, but by ways that have not yet been accurately traced The Hexaplaric, Hesychian and Lucianic texts acted and reacted upon each other. The result is that most of the extant manuscripts of the Septuagint contain readings from each of the three textual families. Criticism is at work to trace the respective influences of each text upon the manuscripts now to hand. Consult Field, Originis Hexaplorum quæ supersunt, sive veterum interpretum Græcorum in totum Vetus Testamentum fragmenta' (1875).

A. Papyrus Manuscripts.—About 40 papyrus manuscripts of parts of the Septuagint have been found in recent years. Of these the most important are (1) Oxyrhyncus Pap. 656, early 3d century, preserving parts of Gen. xiv-xxvii, wherein most of the great vellum manuscripts are defective; (2) British Museum Pap. 73, called U, 7th century, Psalms 10-33; (3) a Leipsig Papyrus, 4th century, Psalms 29-54; (4) a Heidelberg Papyrus, 7th century, Zachary iv, 6—Malachy iv, 5; (5) a Berlin Papyrus, 7th century, Zachary iv, 6—Malachy iv, 5; (5) a Berlin Papyrus, 4th or 5th century, containing some 30 chapters of Genesis.

B. Vellum Uncial Manuscripts.—Parsons Vetus Testamentum Græcum cum Variis Lec-

tionibus, 1798), designated uncial manuscripts of the Septuagint by Roman numerals, minuscipis of the Septuagint by Roman numerals, minuscule by Arabic. Lagarde maugurated the non-common usage of Roman and Greek capitals for unc.als

Von Soden's system of manuscript symbols, though illuminating, has not been widely adopted The important vellum uncial:

of the Septuagint text are here subjoined.
Aleph, Cod Sinaiticus (c 350), 43 leaves at
Leipzig, 156 together with New Testament a Leipzig, 156 together with New Testament a Petrograd; contains fragments of Genesis and Numbers, I Paral 9 27—19.17, Esdr 9 9 to end, Esth, Tob, Judith, I and 4 Mach, Isa, Jer, Lam (in part), Joel, Abd-Mal, the Poetical Books, the entire New Testament, Epistle of Barnabas, and part of 'Shepherd of Hermas' The text is mixed; in Tobit it widely differs from A and B Two correctors are of the 7th century. The first writes at the order the 7th century The first writes, at the end of Esther, that he compared the manuscrip-with a copy of the Hexaplaric text, authenticated by Pamphilus

A, Cod Alexandrinus, 5th century, in British Museum, complete Bible (excepting Psalms 50 20—80 11 and smaller lacunæ); includes deuterocanonical books and fragments, apocryphal 3 and 4 Mach., also 1 and 2 Clement, of Egyptian provenance, and likely Hesychian in

text; differs much from B, especially in Judges. B, Cod Vaticanus, c 350, in Vatican Library, complete Bible; the Old Testament lacks Gen. i-xlvi, 28, 1 and 2 Mach, parts of 2 Kings in Psalms 105-137; the New Testament lacks Hebr 9.14, 1 and 2 Timothy, Titus, Apoc; provenance, Lower Egypt; text deemed by Hort to be aligned to the Harapalories. to be akin to the Hexaplaric.

C, Cod Ephræm, 5th century palimpsest, in National Library, Paris; 64 leaves of Old Testament, 145 out of 238 leaves of New Testament.

D, Cotton Genesis, 5th century, British Museum; fragments of Genesis: almost destroyed by fire in 1731, but previously collated E, Cod Bodleianus, 9th or 10th century, Bodleian Library, Oxford, Heptateuch, frag-

Q, Cod Marchalianus, 6th century, Vatican, Prophets complete; provenance, Egypt; text, Hesychian; marginal notes from Hexapla con-tain Hexaplaric signs.

Theta, Cod. Washington, 5th or 6th century Smithsonian Institution, Deuteronomy to Toshua.

Among uncial manuscripts of the Septuagint are also listed 17 codices, some of the 5th and 6th century; seven Psalters of the 9th or 10th century; and 18 fragments

C. Vellum Minuscule Manuscripts.—More

than 300 are known but not classified. Few bear witness to the entire Old Testament; the greater part are Psalters The most critical use of the minuscules of the Septuagint is evidenced by Brooke and McLean, 'The Old Testament in Greek' (Vol. I, The Octateuch, 1006-17) 1906-17).

Bibliography.— Swete, 'Introduction to the Old Testament in Greek' (1900), and 'The Old Test. in Greek' (3d ed. of Vols. I and II, 1907; 4th ed. of Vol. III, 1912); Kenyon, 'Our Bible and the Ancient Manuscripts' (1898); Nestle, 'Septuagintastudien' (1886-1907).

2°. New Testament Greek Manuscripts.—According to Von Soden ('Die Schriften des Neuen Testaments in ihrer ältesten erreichbaren

Textgestalt, 1902), 2,328 Greek New Testament manuscripts are extant; only about 40 contain, either entire or in part, all the books; 1,716 are of the Gospels, 531 of Acts, 628 of the Pauline Ep.stles, 219 of Apocalypse.

A Papyrus — About 31 papyrus fragments, of which six belong to the 3d century, bear most important witness to parts of 12 books of the New Testament Consult Milligan, 'Greek Papyri' (1912), and 'The New Testament Documents' (1913).

B Vellum Uncials - Besides Aleph, A B C, already described, there are some 160 vellum uncials of the New Testament; 110 contain the Gospels or a part thereof. The most important

of these manuscripts are:

D, Cod Bezæ, 5th or 6th century, Cambridge; Gospels and Acts in Greek and Latin, excepting Acts xxii, 29 to end; text, Western, i.e., that of Old Latin and Old Syriac.

Ds, Cod Claromontanus, 6th century, Nat Libr, Paris; Pauline Epistles in Greek and

Latin, each independent of the other.

E. Cod. Basileensis, 8th century; Univ. Libr.,

Basle, Gospels.

E2, Cod. Laudianus, 6th century, Oxford, in Bodleian Libr., Acts in Greek and Latin, same text as D

Es, Cod Sangermanensis, 9th century, Imper. Libr., Petrograd, Pauline Epistles in Greek and Latin, same family as D2.

F, Cod. Boreeh, 9th century, Utrecht, Gospels.

F2, Cod Augiensis, 9th century, Trinity Col Cambridge, Pauline Epistles in Greek and Latin, same family as D₃, E₂, G₂.
G, Cod Wolfii, 9th century, Cambridge and

London, Gospels.

G2, Cod Bærnerianus, 9th century, Dresden,

Pauline Epistles in Greek and Latin.

Washington Manuscripts, called W and I by Gregory, giving a 5th or 6th century text of Gospels and Pauline Epistles, Smithsonian Institution

C Vellum Minuscules .- The vast number of minuscule witnesses to the New Testament text would seem to indicate a rich field of research for the critic. Such is not the case. Ninety-five per cent of these manuscripts are of little moment; they represent an inferior type of text,—that called the textus receptus Only those minuscules attract attention which approach to one of the great uncials. Thus approach to one of the great uncials. the "Ferrar Group" resemble the text of D

Bibliography.— Kenyon, 'Textual Criticism of the New Testament' (1912), and 'Paleography of Greek Papyri' (1899); Warfield, 'Textual Criticism of the New Testament' (1886); Tischendorf, 'Novum Testamentum Græce' (1869), together with Gregory's together with (1869),Gregory's Prolegomena thereto (1894); Gregory, 'Canon and Text of the New Testament' (1907); 'Textkritik des Neuen Testaments' (1909), and 'Die Griechieschen Handschriften des Neuen Testaments' (1908) Testaments' (1908); Von Soden, 'Griechisches Neues Testament' (1913), and 'Die Schriften des New Testaments' (4 vols., 1911-13); Nestle, 'Textual Criticism of the Greek Testament' (1901); Hutton, 'Atlas of Textual Criticism' (1911)

IV. Latin Manuscripts.— Epigraphists find far greater variety of script in Latin than in Greek manuscripts. Hence the former are divided into uncials, semi-uncials, capitals, minuscules and cursives and these divisions are sub-divided. The time, place and even the monastery of the copyist may often be traced by the very distinct script of the text.

1°. Old Latin Manuscripts - The origin of the Old Latin text is wrapped in obscurity. Three distinct types are recognized,—the African, European and Italian. The African text is that used by Tertulhan (c. 150-220), and Saint Cyprian (c 200-258); it is the crudest in style, and apparently the earliest to be made. The European text is less crude in style and vocabulary; and may be an independent translation The Italian text, probably the Itala which Saint Augustine preferred to all others, is the version used by Saint Jerome in his revision About 40 manuscripts preserve this pre-Hieronymian Laun text,—27 manuscripts of Gospels, seven manuscripts of Acts, six manuscripts of Paul's Epistles, fragments of Catholic Epistles and Apocalypse. All show the influence of the Vulgate or of corrections made by scribes The most important Old Latin manuscripts are the bilinguals already noted: D, D₃, E₂, E₃, F₃, G₃. Besides there are the codices Vercellensis, 4th century; Veronensis, 5th century; Palatinus, 5th century; Brixianus, oth century; Corbeiensis, 5th century; Gigas, 13th century; Palimpsest de Fleury, 6th century; Bobiensis, 4th century. Cf. Burkitt, 'The Old Latin and the Itala' (1896); Wordsworth, Sanday and White, 'Old Latin Biblical Texts' (1883–97); Buchanan, 'Old Latin Biblical Texts' (1907–11) and 'Sacred Latin Texts' (1912-14).

2°. Vulgate Manuscripts.— More than 8,000 manuscripts of the Vulgate are extant, most of which are later than the 12th century and of little use in the reconstruction of the sacred Wordsworth and White, in their critical text (1889-1905), collate 40 of the most important Vulgate manuscripts The Benedictine Commission for the Revision of the Vulgate, established by Pope Pius X, is at work on the collation of this vast store of manuscripts; its task is to reconstruct the various families of the Vulgate text,—the Spanish, Italian, Irish, French, etc.,—to sift out the Old Latin readings and other interpolations, and to reach back as nearly as possible to the text that was issued by Saint Jerome. Chiefest among the Vulgate codices are Amiatinus, 8th century. Cavensis, 9th century; Fuldensis, AD. 541-546; Kenanensis, Book of Kells, 8th century; Stonyhurstensis, 7th century.

V. Other Versions.—Syriac manuscripts represent six distinctive Syriac versions of the New Testament. The Old Syriac versions of the about the middle of the 2d century, is represented by two important manuscripts of the 5th century. The Curetonian Syriac manuscript was discovered in 1842 among manuscripts brought to the British Museum from the monastery of S. Maria Deipara, in the Nitrian Desert, Egypt; and was published by Cureton in 1858. The Sinaitic Syriac manuscript was found by Mrs. Lewis and Mrs. Gibson, in 1892, at the monastery of Saint Catherine, on Mount Sinai. Cf. Bensley, Harris and Burkitt, 'The Four Gospels in Syriac transcribed from the Sinaitic Palimpsest (1894); Lewis, (Light on the Four Gospels from the Sinai Palimpsest (1913):

Durkitt, (1914). Mepharreshe) Evangelion ďa

Civity.

The Distribution is a Syriac harmony of the Green's, male about an 170 by Tatian, an Assertan and disciple of Saint Justin Martyr. The ruly martisciple of Saint Justin Martyr. The ruly martisciple feotods thereof are two Aralic vers, is, described one in Rome and the other in Expt. which were published by Casta in 1868.

The Politics of Striac Vulnate, was made by Raitula, An. 411-435. The Peshitta Pentateuch, dated An. 464, in British Museum, is the earliest dated Billical manuscript. The Peshitta Guspels number 125, Acts 58, Paul's Episiles, 57; two of these New Testament MSS are of the 5th century.

The Phartican Syriac version has reached us only in a martiscript of Apocalypse at Trinity College, Dublin, and in the four minor Catholic Epistles.

The Harkican Syriac version is witnessed to

The Harklean Syriac version is witnessed to by 35 manuscripts dating from the 7th century

and later; its 'ext is like to that of D

The Palestinian Syrias version is found in lectionaries and fragmentary manuscripts; these latter date from the 11th century and later.

2° Armenian Manuscripts date from AD 887,

are very numerous and have not yet been accurately collated

3°. Coptic Manuscripts—By the time Egypt became Christian, the 3d or 4th century, its ancient language had been evolved into the following dialects Sahidic, or Theban, of Upper Egypt; Akhmimic, a dialect that was later superseded by Sahidic; Fayumic, the dialect of Fayum; Middle Ezyptian; Bohairic, or Memphine, the dialect of Bohaireh,—ie, of the northwestern province of the Delta. The chief Sahidic manuscripts of the Bible, that have been collated, are among the 58 volumes, discovered (1910) in the Fayûm and now called the Morgan Collection,—six books of the Old Testament and the entire New Testament except the Apocalpyse. The British Museum also has parts of the Old Testament, Acts and Apocalpyse. Moreover, the bilingual T, Cod. Borgianus, 5th century in the Voticen preserves. gianus, 5th century, in the Vatican, preserves Greek and Sahidic. Bohairic is well represented by manuscripts of the same character as Aleph-B. The Curson Catena, dated AD 889, is the earliest extant Bohairic manuscript and is in the Parkham Library. Cf Crum, 'Catalogue of Coptic Manuscripts in the British Museum' (1905); Wallis Budge, 'Coptic Biblical Texts of Upper Egypt² (1912).

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MANUTIUS, ma-nū'shī-us, Aldus (Ital. Manuzio, Manuzzi and Manucci), Italian printer: b. Sermonetta, near Belletri, in the neighborhood of Rome (and hence sometimes known as Romanus), 1450; d. 6 Feb 1515 He began his studies at Ferrara, and continued them at Rome where he was tutor to princely families. He learned Greek in Ferrara under Guarini and at the suggestion of the Prince di Carpi established a printing-press at Venice 1489. He gained the reputation of being learned in Greek, Hebrew and Latin and entertained in his house many scholars of the day, forming his "Neacademia" or New Academy,

which later was styled "Academia della Fama" He was the author of 'Dictionarium Græcum' (1497); 'Institutiones Græco-Latinæ' (1501-(1501) (1501) (1502) (1504); ((1533) to manage the printing-press at Venice, and subsequently (1561) presided over the papal press, Typographia Vaticana, at Rome He wrote a commentary to Cicero's Letters, and Epistolæ Selectæ. ALDUS, the younger son of Paulus (b. 13 Feb 1547; d. Rome, 28 Oct. 1597), was a scholar and author from his earliest youth. He continued his father's work at Venice and Rome Consult Renouard, 'Annales de l'Imprimerie des Aldes' (1834), Didot, 'Alde Manuce et l'Hennénisme à Venise' (1873); Goldschmid, 'A Biographical Sketch of the Aldine Press at Venice' (1887); Omont, 'Catalogues des Livres Grecs et Latins, imprimér par Alde Manuce à Venise' (1902) Consult De Vinne, T. L, 'Notable Printers of Italy During the Fifteenth Century' (1910). See ALDINE EDITIONS

MANX CAT, a breed of house-cats, originating in the Isle of Man, which are characterized by very high hindquarters, and, as a rule, by a very short tail See CAT.

MANX LITERATURE. The Celtic dialect of the Isle of Man, one of the three sub-divisions of the Gaelic language, is closely related to the Irish and the Scottish Gaelic, and nearer to the latter than the former. (See Celtic Languages; Gaelic Literature). The literature of the language consisted mainly of ballads and carvels (or Christmas carols) The earliest monument of the vernacular is 'The Book of Common Prayer,' translated by Bishop Division 1610 (received in 1805) In late Phillips in 1610 (reprinted in 1895) In later times the orthography closely followed English In the middle of the 18th century English was a foreign tongue to about two-thirds of the common people, but since that time the decline in the use of Manx has been very rapid, and only two or three thousand of the islanders now speak it The last edition of the Bible published in Manx was dated 1819, and the last edition of the New Testament was published in the New Testament was published to the New Tes lished in 1840. Consult Rhys, 'Outlines of the Phonology of Manx' (1895); Kelly, 'Practical Grammar of Manxs' (1803; reprinted 1859); Goodwin, 'First Lessons in Manx' (1866); Goodwin, 'First Lessons in Manx' (1866); Jenner, 'The Manx Language, Its Grammar, Literature and Present State' (Trans. London Philol Soc 1875); Moore, 'Surnames and Place Names of the Isle of Man' (1890); 'Folklore of the Isle of Man' (1891); 'Manx Carols' (1891); and History of the Isle of Man' (1900).

MANZANILLO, män-thä-nel'yo, Cuba, city, port of entry, in the western part of the province of Santiago de Cuba, on the Gulf of Guacanabo on the southern shore. It has a large harbor which is protected by a number of small islands. The city is the port for Bayamo, an inland city about 40 miles east by north from Manzanillo The low land and the mangrove swamps around the place make it very un-healthy. It is well built and has a number of fine churches, hospitals and schools,--among the schools four are high schools. Urban pop about 25,000.

MANZANILLO, Mexico, seaport, in the state of Colima, on the Pacific at the entrance to the Bay of Cuyuttan, about 40 miles west of Colima, the capital of the state A railroad connects Manzanillo and the capital, and the city has steamer connections with the principal ports on the Pacific Coast. In normal times its imports total \$1,500,000 annually

MANZANITA, a popular name for various species of Arctostaphylos of the family Ericacea, especially A pungens and A mansanita They are shrubs or small trees which sometimes exceed 20 feet in height, and often form impenetrable thickets in the region, Pacific Coast of North America from Oregon southward. They have alternate, evergreen, entire leaves, usually white or pinkish flowers in panicled racemes, and generally smooth berry-like drupes Another wellknown species often called by this name is the bearberry (qv), a trailing evergreen shrub which extends from the Arctic region to the mountains of Mexico, whose red berries form one of the principal foods of ptarmigan and other related birds The great-berried manzanita (A glauca), a California species, bears fruit more than half an inch in diameter Of the 30 species of the genus, probably a dozen are used for ornamental purposes; some Central American ones in greenhouses where the climate prevents outdoor use; the shrubby western kinds in mild climates; and only the trailing kinds in cold localities The gnarled roots are an important source of fuel in the untimbered parts of California.

MANZANO, Juan Francisco, hoo-ān' frānthēs'kō man tha'nō, Cuban poet: b Havana, August 1797; d. there, 1854 A negro slave he wrote and published several volumes of verse before he was manumitted (1837), gaining especial fame by 'Mis treinta Años' (1836), translated into French, German and English, and by 'Apuntes Autobiográficos,' which was never printed in Spanish, but was published in English by Richard Robert Madden in 1840 under the title 'Poems by a Slave in the Island of Cuba recently Liberated.' Manzano's other works include 'Cantos à Lesbia' (1821), several excellent lyrics reprinted in Calcagno's 'Poetas de Color' (1868), and a drama 'Zafira' (1842).

MANZANO MOUNTAINS, a range on the east side of the Rio Grande Valley in Bernalillo, Torrence and Valencia counties southeast of Albuquerque, N. Mex. It extends from Tijeras Canyon on the north to Abo Pass on the south, a distance of 45 miles. The very steep western front of the mountain is granite and schist, capped by a thick sheet of limestone which dips east and constitutes the long sloping plateau of the summit and east side. The highest summits are Manzano Peak, 10,086 feet; Osha Peak, 10,023 feet, and Mosca Peak, 9,723 feet, which are about 5,000 feet above the Rio Grande. To the east is the Estancia Valley, long famous for its salt lakes. Near Bosque Peak is a large spring. The region is forested with yellow pine, puñon and jumper, and is included in the Manzano Forest Reserve. Deer, bear and wild turkeys and many minor wild animals remain in these mountains. Ores of gold, lead and silver are mined on the west slope. Most of the long canyons on the eastern slope contain streams from large springs. The water is utilized by many settlers

mostly Mexicans who have occupied the region for several centures. Their small plazas or settlements are Chihh, Tejique, Torreon, Escabrosa, Punta del agua and Manzano. The latter has given name to the mountain, the plaza taking its name from a grove of apple trees (Manzano in Spanish) of prehistoric origin. The old ruins of Abo and La Cuara are near the south end of the range.

MANZANOS, man-za'nōs, a natural park in Lincoln, Bernalillo and Santa Fé counties in New Mexico, southeast of Albuquerque The Manzano Range, the highest peak of this section, numerous table-lands and valleys, with many springs and small streams, are the chief features of this park The Rio Grande is on the west side; the base of the mountains is about 1,000 feet above the river and about 11,000 feet above the level of the sea The almost perpendicular, stupendous red cliffs which rise above the plain and form the western face of the mountains are almost unscalable South of the red-cliff region is the canyon of Las Moyas, and south of this canyon Bosque Peak, the highest point of the range Near the summit of the peak is a spring which gushes up in a lake about 50 feet wide.

The view from the summit of the range at some points includes the green valley of the Rio Grande, mountains west of Albuquerque and north to the walls of Sante Fé, and intervening valleys and mountains. On the west of the park, or the western border, are the white Manzano salt lands, on the southeast the gypsum desert. On the level mountain tops are stretches of clearing where the grass grows luxuriantly. Between Hell Canyon and Childli is a region of immense pine and piñon forest. Some of the animals found here are deer, bear and wild turkey. Grains, vegetables, alfalfa, fruit and other farm products are raised. Sheep, horses and cattle are raised extensively.

MANZONI, man-zō'nē, Alessandro, Italian poet and novelist: b. Milan, 7 March 1785; d. there, 22 May 1873. He studied at Milan and Pavia, and published in 1806 his poem on the death of his friend Imbonati, which was followed in 1815 by his 'Sacred Hymns' ('Inni Sacri'). In 1819 appeared his first tragedy, 'Il Conte di Carmagnola,' the first drama in which an Italian defied the unities. This play was reviewed and praised by Goethe, who took a warm interest in every subsequent production of Manzoni. The death of Napoleon inspired one of the finest odes of the century, 'Il Cinque Maggio' ('The Fifth of May'). In 1823 his second tragedy, 'Adelchi,' appeared. This, as well as its predecessor, finds more favor in personal reading than on the stage. After this Manzoni divided his time between country pursuits at his residence in the neighborhood of Milan and the composition of his romance 'I promessi Sposi' ('The Betrothed'), a Milanese story of the 17th century, published in 1827, and which has been translated into most of the European languages (Eng. in Bohn's Library 1883). He strove earnestly to make Tuscan the universal language in Italy. As a poet he outrivaled all his Italian contemporaries. Verdi's 'Manzoni Requiem' is a magnificent musical tribute to his memory. (See Betrrothen, The). Consult Sauer, 'Alessandro Manzoni' (1872); Stoppani, 'I primi anni A. Manzoni' (1874);

Lem sib, (A. Manzori, studio librrafico e critivo) (1873 et Cam a, (A. Manzoni, reministrate) (1885), Venne, (Le remainisme de Marzoni (There 187), Eng. trans. by Goddes-Venkins, Boston 1811).

MAORIS, ma'ò-riz er mew'riz, native in-ha' nam's el New Zeuland, a people of Polynehat rares of New Zadian i, a people of Polyne-sian rare, as is attested not only by ethnological constlerations, but by their own legend that they came from Hawaiki Hawaii or Samoa). Their carefully kept genealogies go back less than a score of generations, so that it seems probable that their coming to New Zealand was four or the continues and. Remains of a previous pop-ulation, with Propose characteristics have been ulation with Papuan characteristics have been found. The Maoris are well built, with longer lodes and shorter legs than the European type; they have black hair, little whisker on the face, and smooth fodies, wide open, straight black eyes, heads slightly macrocephalic, the index being 77, nose straight and color slightly brown. Their costume, no dou't adopted only upon their coming to a colder country than their early home, was a loose garment, woven from the fibre of Formium tenax. Tattooing they brought with them to New Zealand and perbrought with them to New Zeatanu and perfected it. They tattooed the face, decorating in this way the young warrior after his first successful fight, and adding fresh designs for each new exploit. They also knew how to make carvings of great delicacy, and armed themselves with stone weapons. Their religious between their control of the company that liefs were crude, but tinged with animism; they recognized the soul as distinct from the body and surviving it, but connected an enemy's cunning and bravery so closely with his dead body that they are it, thus to win his warlike virtues, locating intelligence in the brain and courage in the heart. Their worship combined ancestral cult with defication of natural forces and some fetishism. They were divided into tribes, six of these representing the divisions among the original settlers. A warlike people, their chief had absolute power and could pronounce "tapu" or taboo (q.v.) at will. Before the coming of the English they were mostly vegetarian, caught some fish, lived in bark or bough huts and made canoes. Polygamy was practised, and the arikis or priest-chieftains acted as physicians, having some knowledge of herbs. Both their numbers and physique have suffered sadly since the introduction of civilization. For the history of the Maoris since British occupation (see New ZEALAND, Government and History). Consult Cowan, James, 'The Maoris of New Zealand' (in 'Makers of Australasia' Melbourne 1910); Makeriti, 'Old Time Maori' (London 1938).

MAP, or MAPES, maps, Walter, English scholar and poet of the 12th century. He was probably a native of Herefordshire. He studied at the University of Paris and became a favorite at the court of Henry II. He attended the Lateran Council of 1179, and was appointed archdeacon of Oxford in 1197. Map is now generally believed to have been probably author, or in large part, author of 'Lancelot' in the Arthurian cycle. It is extremely probable, at any rate, that Map did contribute to the bringing of the cycle into its present state, but it is uncertain to what extent his work has survived. He is undoubtedly the author of a curious book 'De Nugis Curialium,' a notebook of the events

of the day and of court gossip. It was edited for the Camden Society in 1850 by Thomas Wright. To Map is attributed the famous drinking-song beginning.

"Meum est propositum in taberna mori"

MAP. The word derives from the Latin matta meaning napkin, cloth, sheet (just as we speak now of topographic "sheets"). A map is a symbolized picture of the Earth pattern drawn to scale on a horizontal projection, to which lettering usually is added for identification. Alstraction and symbolization often go far from the original conception of a picture, as for instance on a political map.

stance on a political map.

Scale.—Every map is on a definite size relationship with the part of the land it represents, which can be expressed in three different ways:

(1) Numerical scale, or representative fraction, as 1.1,000,000, meaning that one inch on a map represents 1,000,000 inches in nature, or nearly 16 miles.

(2) Inch to mile scale, as 1 inch to 8 miles

(2) Inch to mile scale, as 1 inch to 8 miles (1 506,880), meaning that one inch on the map represents 8 miles in nature.

Enlarging and Reducing Maps —Changing the scale of maps can be accomplished by several

methods:

(a) The quadrangle method, by drawing closely set nets of parallels and meridians both on the original map and for the new drawing on larger or smaller scale. All features are filled in by hand. This method is especially good if the projection system is also changed

(b) Photostat or photograph, which, however,

often shows some distortion.

(c) Pantograph, which instrument is based on a parallelogram with free moving angles and can enlarge or reduce drawings with great precision.

(d) By various arrangements of lenses, mirrors, or prisms an enlarged or reduced image can be projected upon the drawing paper. Maps on a scale of 1:1,000,000 and smaller

Maps on a scale of 1:1,000,000 and smaller are called *small-scale* maps; *large-scale* maps are over 1.100,000; in between are the *medium-scale* maps.

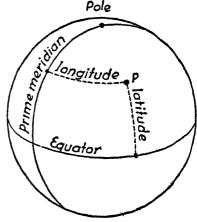


Fig. 1.-Latitude and longitude.

Parallels and Meridians .- The ancient Greeks established a co-ordinate system dividing the arc between the equator and the poles into 90° in parallel circles which get smaller nearer the equator. Similarly the equator is divided into 360 parts and through the division points and the two poles are 180 semicircles or meridians. Distance from the equator measured along a meridian and expressed in degrees (minutes and seconds) is called latitude Distance in degrees reckoned from a chosen prime meridian measured along a parallel is called longitude While all degrees of latitude are equally long (about 69 miles), degrees of latitude vary from 69 17 miles at the equator to 0 at the pole. For any degree

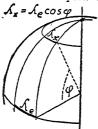


Fig. 2.—Longitude varies with the cosine of the latitude. λ_x =longitude on any parallel. λ_c =longitude on the equator. ϕ =latitude.

of longitude where ϕ is the latitude, for instance 1° of longitude at lat. 60° is one half of 1° long. at the equator, cos 60° being 05.

In all these considerations the Earth is regarded as a perfect sphere. As the exact form of the Earth is more nearly a rotational ellipsoid. the degrees of latitude are slightly smaller near the equator, 687 miles, and larger near the poles, 692 miles Prime meridians changed a great deal during history from the Fortunate Islands of Ptolemy to Ferro (qv) in the Canary Islands. Even Washington, Philadelphia, Boston, and Hartford were used as prime meridians. By international agreement, at present the meridian at the Royal Observatory in Greenwich, England, is used for prime meridian.

Most maps are oriented with north on top, but this is conventional. Other orientations are often used at present to bring out hidden rela-

tionships.

Projections.—The spherical surface of a globe cannot be flattened into a map without stretching or tearing. If only a small part of the Earth's surface is shown, as on large-scale maps, distortion is negligible, but on medium-scale maps, and especially small-scale maps of the whole Earth, considerable distortion is nec-

Several geometrical methods were tried. If the globe is enveloped into a cylinder and the surface is projected upon this surface and then the cylinder is cut open and laid out flat, we have a cylindrical projection. Similarly, if we cap the globe with a conical hat, project upon the cone, split open the cone along one of its elements and lay it out flat, we have a conical projection. Also, if the surface of the globe is projected upon a tangent board from some eye point at a selected distance, we have an asimuthal projection.

These projections are derived from actual perspective projection from a point or points upon a surface. Except for a few azimuthal projeca surface. Except for a few azimumal projections, however, no perspective projections are in actual use Most of them are simply some kind of network of parallels and meridians to suit the map maker's purpose A map projection can be defined as any orderly network of parallels and meridians when subject a map can be drawn. and meridians upon which a map can be drawn.

As the problem of flattening spherical surfaces is impossible, there can be no perfect projection. We can choose from dozens of imperfect solutions the one which is most suitable for our particular purpose Some projections have special merits Equal-area or equivalent projections are those in which every part of the map, and the map as a whole, has the same area as the corresponding part of the Earth's surface. To achieve this, shapes and angles have to be considerably distorted. Conformal or orthomorphic projections are those in which every small portion has the same shape as the corresponding part on the globe. Not only are the parallels and meridians right angles to each other, they have also the correct proportions. To achieve this, the scale of the map has to vary a great deal Some projections are not equal-area nor conformal but have small scale errors.

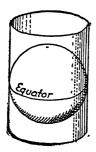
It is obvious from the foregoing that on any map only the parallels or only the meridians or certain other lines can be true to scale; all other distances are distorted. Which lines are selected to be true to scale, that is the same scale as on the corresponding globe, is the fundamental consideration in projections Several hundred projections occur but only a few selected projections

are presented here

Rectangular Even-spaced Projection.—This is the simplest of projections, consisting of evenspaced horizontal parallels and vertical even-spaced meridians. Meridians are spaced on the central parallel of the map according to

 $\lambda_x = \lambda_c \cos \phi$ (see Fig. 2).

Mercator Projection.—The equator is divided truly for vertical meridians. Parallels are horizontal, spaced conformally; that is, their relation





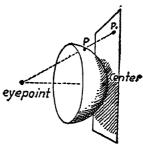


Fig. 3.—Cylindrical, conical and azimuthal projections.

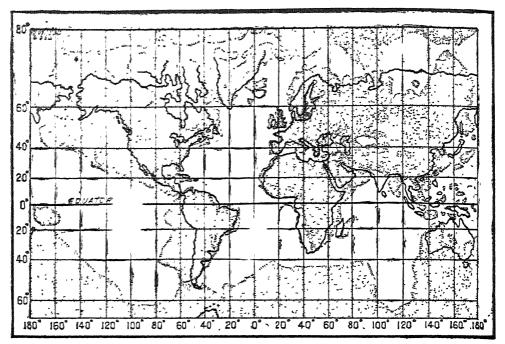


Fig. 4.—Mercator's projection from his World Map of 1569. Mercator's delineation of the land is dotted.

to the meridian is the same as on the globe. On the globe the meridians converge, but in this projection they are parallel. To get the correct proportion, the parallels are spaced at increasing distances toward the poles. The poles are at infinite distance.

The chief merit of the projection is that compass directions, or rhumb lines, appear as straight lines. (On the surface of the globe they spiral towards the poles) For this reason the projection is ideal for navigation, in spite of the enormous variation of scale. It is less good for world maps for which it is frequently used. The pro-

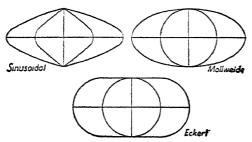


Fig. 5.—Outlines of the world and the hemisphere in various projections with horizontal parallels.

jection was delineated by Gerardus Mercator, the great Belgian cartographer, in 1569 (see Fig. 4).

Other Projections.—Among other projections with horizontal parallels and vertical meridians, mention should be made of the Gall's projection and also of Miller's cylindrical projection, in which the parallels are spaced at increasing distances nearer the poles but not so much as in the Mercator projection.

The sinusoidal and the Mollweide, or homolographic, projections have both horizontal parallels but the meridians converge toward the poles. Both projections are equal-area. The Eckert projection is similar, but the poles are represented as lines half the length of the equator. All these projections are popular for world maps and continent maps.

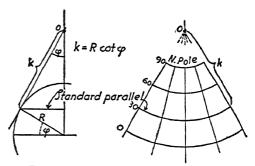


Fig. 6.—Construction of the conic projection.

In the *conic* projection, the globe is capped by a cone which touches it along a selected standard parallel. The radius of this standard parallel is l=R cot ϕ . The standard parallel is obviously divided truly; the meridians are radiating straight lines, placed truly on the standard parallel, and the parallels are concentric circles. For best results usually the central parallel of the map is taken as standard. The spacing of the parallels would be uneven in the actually projected network. In the practically used conic projection, the parallels are concentric circles placed at their true distances. The projection is used for country and continent maps in the tem-

perate zones on account of its small scale error. The scale error is further reduced in the conic frejection with two standard parallels. On a map of the United States the maximum scale error

would not exceed 125 per cent.

By different spacing of the parallels, this projection can be made equal-area. The Albers conical equal-area projection is adopted as the best projection for the country by the United States Geological Survey. By spacing the parallels differently, the projection can be made conformal The Lambert conformal come projection has relatively straight azimuths for which it is generally used for air navigation charts.

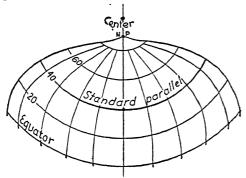


Fig. 7.—Bonne projection of the half-hemisphere centered on lat. 40° N.

The Bonne projection is similar to the simple conic, except that not only the standard parallel, but all parallels are divided truly, which makes the meridians curved and the projection equalarea. It is a popular all-around projection, used for all scales, from world maps to topographic sheets.

The polycome projection has a truly divided vertical central meridian. The parallels are nonconcentric circles, each with a radius $1=R \cot \phi$, as if each would derive from a tangent cone. Each parallel is divided truly, the connecting lines form the meridians. The United States Geological Survey topographic sheets are on this projection.

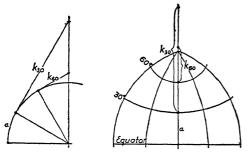
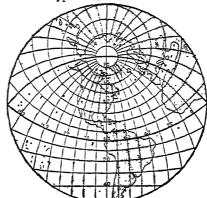


Fig. 8.—Construction of the polyconic projection.

The azimuthal projections derive from projecting a part of the earth's surface upon a plane surface from an eye point. The plane can be tangent at the pole, at the equator, or any other point, and all three views—polar, equatorial, and oblique—are often used.

In the *gnomonic* projection the eye point is in the center of the sphere. The projection has extreme distortions of size and shape, but it shows

all great circles as straight lines, for which it is u-oil for laying out transoceanic sailing and flying routes. The meridians are straight lines; the parallels are hyperbolas.



Fir 9.—Stereographic projection of the hemisphere in oblique view.

It the stereographic projection the eye point is at he antipodal point of the center of the map. he projection has the interesting property that no only all parallels and meridians, but also circular lines of the globe appear as circles on he map too. It is a conformal projection, but it is not much used on account of its considerable distortion of scale.

The eye point of the orthographic projection is in the infinite; the rays are parallel. parallels and the meridians are elipses, ranging from a straight line to a circle. The great merit of this projection is its visual quality—it looks like a globe. Although the distortion on the sides of the man is enormous, we see everything in correct proportion because we perceive not a map but a picture of a three-dimensional globe. For this reason it became very popular for socalled «global» maps.

Two azimuthal projections do not derive from direct perspective methods. The asimuthal equidistant projection is the only one in which every point is shown, not only the correct distance, but also in correct direction (azimuth) from the center point. All other distances and directions, however, are distorted. The Lambert azimuthal equal-area projection is very good for hemispheres and for continent maps.

Besides these, a number of interrupted, starformed, and other projections are used. Among these the butterfly projection of B. T. S. Cahill is particularly attractive. Another interesting group of projections derives from the oblique, or transversal development of the cylindrical and related projections. The transverse Mercator projection is particularly interesting and used for the new maps of the British Ordnance Survey.

Symbols.—As all geographic information of the map is given with the help of symbols, a good symbol is one which can be recognized without a legend, yet is simple, distinct, and does not take up more space than its importance allows. Lines, patterns, and colors can all be used. Symbols are different on small-scale maps and on large-scale maps, and it makes a great deal of difference whether colors can be used or not.

Standardization of symbols is necessary by government agencies. Private cartographers, not hampered by such regulations, are in a position

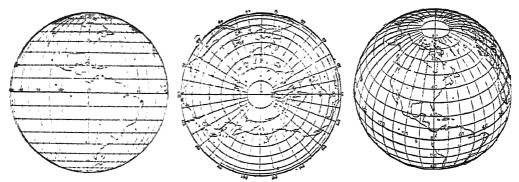


Fig. 16 —Orthographic projection of the hemisphere in equatorial, polar, and oblique views.

to design new and better symbols. Airplane photography presents a rich pattern of the earth's surface which our present symbols are not quite able to express, and a major change is expected in the appearance of maps in the future.

If colors can be used, the conventional color of hydrography (water features) is blue; for hyprography (relief features, such as hills and mountains) brown; and for culture or man-made features, black and red. Vegetation is usually shown with green symbols.

Relief Features.—The representation of mountains is a particularly difficult problem of cartography, essentially because we represent the mountains on maps as seen from above, while our familiar conception of mountains is as they look from below. Several methods are in use.

Hachuring.—This is the older type of repre-

Hachuring.—This is the older type of representation of relief, and is usually applied to black-and-white maps. Slopes are shown by lines of variable thickness running along the «dip» of the slope, the way water would run upon that surface. The steeper the slope, the thicker the line. The method was systematized by F. G. Lehmann, a Saxonian officer in Napoleon's army.

Plastic Shading.—This method requires reproduction by half-tone method, which limits its use. Two methods are used. In «vertical illumination» the steeper the slope, the darker the tone (as in hachuring). This method is used by the topographic sheets of Norway. Much more





Fig. 11.—Topographical features expressed by contour lines. After the U.S. Geol. Survey.

common is «oblique illumination,» somewhat 23 a plaster model of the region would look lighted sideways but photographed from above This method is often used in combination with contour lines.

Contour Lines.—These are continuous lines connecting places of the same altitude above a datum plane, drawn along selected regular intervals. All points between two contour lines have to be at intermediate elevation. Steep slopes produce close intervals; on gentle slopes the contour lines are far apart. The exact angle between contour lines can be expressed by "feet per mile," or graphically by "profiles." All contour lines are horizontal and perpendicular to hachure lines The contour interval varies with the scale of the map and the ruggedness of the land. The 1:62,000 topographic sheets of the United States have 20-foot intervals in hilly country. The datum plane is mean sea level.

Lettering.—Letters obscure by their bulk much topographic detail on maps, and they are kept as small and fine as legibility will permit. If letters are applied to an area, they are spread so as to indicate the trend or extent of the area. Letters are sometimes hand-drawn, but stamped, pasted, or templeted letters are also common. Most United States maps have "slanted" letters for hydrography, "block" or "gothic" letters for relief features, and "Roman" letters for political units.

Composition.—Sectional maps—parts of a larger map—fill a quadrangle between two parallels and two meridians, and title, scale, key, name, authorities, glossary, and all other «marginal information» are set up outside the map. Maps of a unit region, however, have often all this pertinent information collected in a «cartouche» inside the frame of the map. Much empty space can be taken up by «insets.» These insets either show an important portion on a larger scale, or the location of the region on a smaller-scale map.

Reproduction.—Maps are drawn usually 1½ to 3 times the publication size to obtain finer detail. The most common method of reproduction is by offset planography. Only if the map has to be printed together with type is it reproduced by photoengraving (q.v.). Color maps are usually printed from separate color plates drawn on separate papers. Maps reproduced in four-color process are also common. (See Lithography.)

Charte—Marine charts for revisation differ

Charts.—Marine charts for navigation differ from land maps chiefly by their emphasis on the sea. They show submarine contours, usually ob-

tained by sounding. Almost all charts are on the Mercator projection The datum plane is usually a low-water level for sounding, and a high-water level for land features Charting has been greatly helped by the sonic depth finder instruments and from radar, which helps to locate exactly the point of the surveying vessel. The charts of coasts of the United States and territories are surveyed and prepared by the United States Coast and Geodetic Survey, while those of foreign waters are published by the United States Hydrographic Office (qqv.). See also article on CHART.

Topographic Maps.—Every civilized country publishes detailed general maps of the land on 1:25,000-1:100,000 scale. In the majority of countries these maps are prepared by the army. Relief is usually shown by contours, but in reconnaissance maps plastic shading is common. The topographic sheets of the United States are prepared by the United States Geological Survey (q v.) and also by the Corps of Engineers. The fine topographic sheets of England are prepared

by the British Ordnance Surve

Air Navigation Maps.—These are usually published on 1.500,000 to 1:1,000,000 scale, using contour lines with altitude tilts, and show all features which help airmen, especially radio bea-cons The United States Army Map Service has prepared air navigation maps on 1.1,000,000 scale of the entire world.

Military Grids .-- All new topographic maps have a grid system of even squares overprinted,

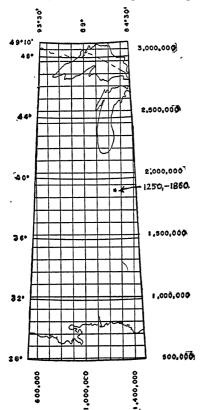
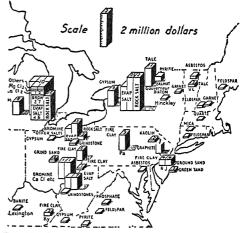


Fig. 12.—Progressive military grid of the U.S. There are seven grid zones. This is Grid Zone C

*From Raisz, E., "Geography of the Mineral Industry," Mining and Metallurgy 1941.

for easier location of spots. These grid systems are drawn upon a standard map in a specified projection and grid distances and directions are not true on any map on another projection, but as long as the area involved is small, there is not much difference. In the United States Progressive Military Grid System, the country is divided into seven grid zones, and a 1,000-yard square grid is drawn upon a polyconic projection

Statistical Maps.—These maps show quantitatively the distribution of a certain variable, as, for instance, rainfall, acreage of wheat, reli-



-Statistical map with superimposed diagrams, the nonmetallic mineral production of the northeastern U.S.* Fig. 13.

gions of people. Three methods are used: (1) isopleths, which are lines connecting equal values; (2) dot system; and (3) superimposed diagrams. The last is recommended whenever the distribution is highly variable or has to be subdivided. «Density of population» maps are the most im-portant in this group. Usually a combination of the dot system and superimposed circular graphs are used on them.

Cartograms.—Highly abstracted diagram-matic maps are called cartograms and are used much in statistical mapping and for showing the distribution or relations of distributions of cer-

tain variables over the earth.

Land Utilization Maps.—These indicate forest, meadow, various types of cultivation, etc., and form the most important type of maps in modern cartography Various colors, patterns, modern cartography

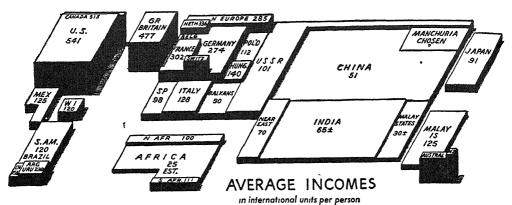
index numbers and figures are used.

Scientific Maps.—This type of map is published in increasing numbers in atlases, books, and periodicals. Not only do the Earth sciences, such as geology, meteorology, climatology, oceanography, seismology, astronomy, plant geography, and zoogeography use maps as an essential part of their presentation, but also economics, history, sociology, etc., use maps in increasing numbers.

School maps, wall maps, city maps, railway, auto-road maps, maps of art and advertising, are just a few more items each of which has its

own specialized cartography. See also GLOBE.

History.—The ability of making maps is an inherent quality of mankind. Primitive people are able to draw maps of large areas in vertical projection without any difficulty. The Eskimos, the Indians, the nomads of Asia and Africa, and



modified after Colin Clark, The Conditions of Economic Progress, 1940

Fig. 14.—Statistical cartogram The base of blocks is proportionate to population. From E Raisz. Atlas of Global Geography.

the South Sea Islanders are excellent map makers.

The oldest maps which survived were made by the ancient Babylonians, but records indicate that the Egyptians, Persians, and Phoenicians also made maps, few of which survived, however.

Cartography as a science was established by the ancient Greeks The Ionian geographers of the 5th and 6th centuries BC drew the earth in the form of a disk floating in the oceans. In the 4th century, an oblong earth was drawn from which our expressions latitude and longitude derive. At the same time arose the idea of a spherical earth, and it was a well-established fact in the time of Aristotle The tilt of the ecliptic was accurately measured and the equator, poles, tropics, zones were defined. The size of the earth was measured by Eratosthenes of Alexandria in the 3d century (with an error of less than 14 per cent, 28,000 miles circumference), and later by Posidonius, who, however, figured it one-third too small This latter measurement was accepted by Ptolemy and influenced Paolo dal Pozzo Toscanelli and Columbus (qq v.). Eratosthenes prepared a map also showing certain principal parallels and meridians in which he was attacked by Hipparchus, who advocated an even system of parallels and meridians dividing the circle into 360 , as we still use it at the present time.

The only Greek map which survived was an atlas of Claudius Ptolemy of Alexandria about 150 AD. Much of his material is based on the Phoenician, Marinus of Tyre. His atlas, a supplement of his 8-volume Geography, consists of 27 detailed maps and a map of the known world. His delineation had an immense influence upon the cartography of the Renaissance, and some



Fig. 15.—Outline of Ptolemy's World Map.

of his mistakes did not disappear from maps until the 18th century.

Roman cartography did not continue the scientific attitude of the Greeks. They preferred a simple map to be used for administrative and military purposes. For this they returned to the disk-like earth of the early Greeks and the Roman Orbis Terrarum became the standard map of the world for 13 centuries. It has east on top and we still speak of "orientation" Most of the map is an exaggerated representation of the Roman Empire with the rest of the world represented only as outlying provinces. A peculiar Roman product was the Tabula Peutingeriana (see Peutinger's Table) from the 4th century Additional production and elimeated on an enormously elongated scroll 22 feet long and only 1 foot wide. A good medieval copy of this map survived.

medieval copy of this map survived.

The early Middle Ages added little to cartography. A great number of crude maps survived in various codices, but they were mostly copies of the Orbis Terrarum Further diagrammatization of this map resulted in the T-in-O maps (Orbis Terrarum) with Jerusalem in the center. These maps, with their regularity, ap-



Fig. 16.—The Orbis Terrarum of the Romans. From E. Raisz: General Cartography (McGraw-Hill 1938).

MAP 258a

pealed greatly to the medieval mind, not interested so much in reality but in divine harmony. A good map of England was prepared by Matthew Paris (qv.) in St Albans, c. 1250.

The Arabs are credited with the first school atlases dating back to the 10th century, showing highly diagrammatic maps. They measured the size of the earth with great accuracy. Their tables of latitudes and longitudes surpass anything prior. The most famous Arab map is the large world map of Idrisi (Edrisi) (1154) of rich detail It shows, however, Christian influence as it was prepared in the court of King Roger II of Sicily.



Fig. 17.-T in O map from the 11th century.

Portolan Charts.—These charts appeared around 1300 and seem to be the copy of a remarkable early chart showing the Mediterranean and Black Seas with surprising accuracy. Indeed, this chart was used for actual navigation for three centuries. Over a hundred copies are known, with but few additions and improvements The original portolan chart was based on an organized compass survey, probably under the Genoese Admiralty.

The Great Discoveries—The introduction of the compass and improved sailing vessels made possible the voyages of Columbus, Magellan, and others. These great discoveries caused a revolution in map making, as America and its relation to Asia had to be explained to the public. The outlines of four maps below show the confusion which prevailed in the minds of cartographers in the early 16th century. Juan de la Cosa's map



Fig. 18.—Diagrammatic Arabic schoolmap from the 10th century.

ot 1500, if its date is correct (which is doubtful), is the earliest representation of the Americas Martin Waldseemüller's (q v.) map is the godfather of America, as it was the first to name the continent so. Diogo Ribero's map is a copy of the padron real or royal map of Spain. This is the first real world map showing the immensity of the Pacific Ocean, with China and India in their proper locations.

Engraving and Printing.—Hitherto all maps were manuscript and reproduced by hand. The invention of engraving and printing made maps very much cheaper and the flow of new information was facilitated. Woodcut maps were common at the end of the 15th century, but gradu-

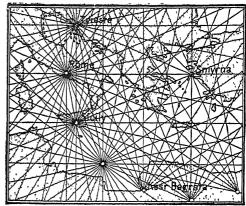


Fig. 19 .- Portion of Portolan Chart, c. 1300.

ally copper engraving became the generally used method. Waldseemuller's map was engraved in copper.

Rediscovery of Ptolemy.—Ptolemy's map survived chiefly through the Arabic scholars. His work was translated into Latin around 1410 and since then it was republished perhaps a hundred times, mostly with the addition of new Tabulae Modernae So great was the authority of Ptolemy that Waldseemuller replaced the good outline of the Mediterranean of the portolan charts with the far worse outline of Ptolemy.

The Dutch School.—The Low Countries, situated between England, France, and Germany, and subject to Spain, had good opportunity to obtain information from these countries Dutch industry and talent supplied the rest, and in the 16th and 17th centuries the Low Countries were the leaders in the map making of Europe, Gerardus Mercator (qv.) of Louvain is called the father of Dutch cartography. The projection bearing his name appeared in 1569 (see Fig 4) Hundreds of maps embodying remarkably correct information and restrained, yet artistic ren dering, bear his name Abraham Ortelius (q.v.) published the earliest modern atlas, the Theatrum Orbis Terrarum, in 1570 Jodocus Hondius and Jan Janszoon followed the Mercator tradition. The House of Blaeu in Amsterdam produced perhaps the best maps of the Renaissance. Among the later Dutch map houses, the Visshers, the Donckerts, Schenck, Allard, and De Witt should be mentioned. The father of English cartography is Charles Saxton (d. 1611); his county maps are superb. The atlases of Norden, Speed, Goss, Pitt, and Seller closely followed the Dutch style.

Surveying Methods—Hitherto almost all maps were the result of development: one person made a map, his successors improved it, and gradually a fair representation developed, supported by a few latitude measurements, otherwise unsurveyed. Yet the principles of triangulation are described by Gemma Frisius in 1526, and Willem Janszoon Blaeu actually triangulated a portion of Holland At the end of the 17th century, the sextant, telescopic theodolite, the planetable, the barometer, and accurate pendulum clocks were available for land measurements.

The French School—Modern cartography dates from the longitude measurements of the French Academy around 1680. About 80 longitudes were accurately measured by simultaneous

MAP 258b



Fig 20 -Famous map of 1529.

observations of the occulations of the satellites of Jupiter, as chronometers were not yet available. The results of these measurements were laid down on a polar map, covering the floor of the Paris Observatory, by Jean Dominique Cas-sini. French cartographers of the 18th century excelled in fine, accurate work, critical, scientific attitude, and less inclination for decoration. Outstanding men were Guillaume Delisle, Jean Bap-Robert de Vaugondy, J. N Bellin, Philippe Buache, Rigobert Bonne and many others

The English School.—Early British cartography was under Dutch influence In the 18th

century the fine French style prevailed, but by the end of the 18th century the British even surpassed the French in the number and excel-lency of their maps. The maps of John and Thomas Bowles, Thomas Jefferys, William Faden, John Rocque, John Cary, and Aaron Arrowsmith were popular even in America.

Surveys—The triangulation of Sci-National France was organized by the Academy of Sciences under César François Cassini de Thury and accomplished in 1744. The preparation of detailed topographic sheets was the further life work of this great cartographer. This was the first great national survey, which was soon fol-lowed by Austrian Belgium, and the British Ordnance Survey 1791. In the 19th century every civilized nation produced its topographic sheets.

Diversification of Cartography.—The 19th century witnessed a great diversification of cartography. Geologic maps of William Smith, school maps of Emil Sydow, physical maps of Karl Ritter, atlases of meteorology and climates of John Bartholomew, relief models of Albert Heim, historical map reproductions of Jomard and Konrad Miller, are just a few examples of various tasks which found a cartographic answer. The International 1:1,000,000 Map of the World is the first great experiment in international cooperation in mapping.

American Cartography.—The oldest map Mmerican Cartography.—Ine oldest map wholly produced and published in America is John Foster's woodcut of New England from 1677. The Bonner map of Boston of 1722 is the first large city map Lewis Evans' Middle British Colonies in 1755 is the most outstanding colonial map. The British naval and military maps, previous to the Paralution by Samuel Holland previous to the Revolution, by Samuel Holland (New York, New England); John Gascoigne

(South Carolina, Georgia), G. Gould (Florida); Ross (Mississippi River); Wm. Brassier (Lake Champlain); J. Montresor (New York state), John Hills (New Jersey); and many others formed a fundament for the later maps of the United States. Washington's surveyors, Thomas Hutchins, Simeon De Witt (qq.v), and others, organized the official cartography of the new state. In the early 19th century almost every state of the Union prepared a state map on 4 to 8 miles to the inch scale. Atlases were published of the first scale. Attases were published in great numbers since Matthew Carey's General Atlas, 1794. Especially famous is Henry S. Tanner's New American Atlas, 1823. The two Tanner brothers, John Melish, Samuel Augustus Mitchell, and later the Colton family, were especially productive.

Wax engraving was invented by Sidney Edwards Morse; his Cerographic Allas appeared in 1841. This method, with its stamped-in names and mechanical appearance, imprinted its style upon American cartography for a century More individual maps were produced by lithography, which was introduced around 1827. The county atlases of the second half of the 19th century are typical American products, and their produc-

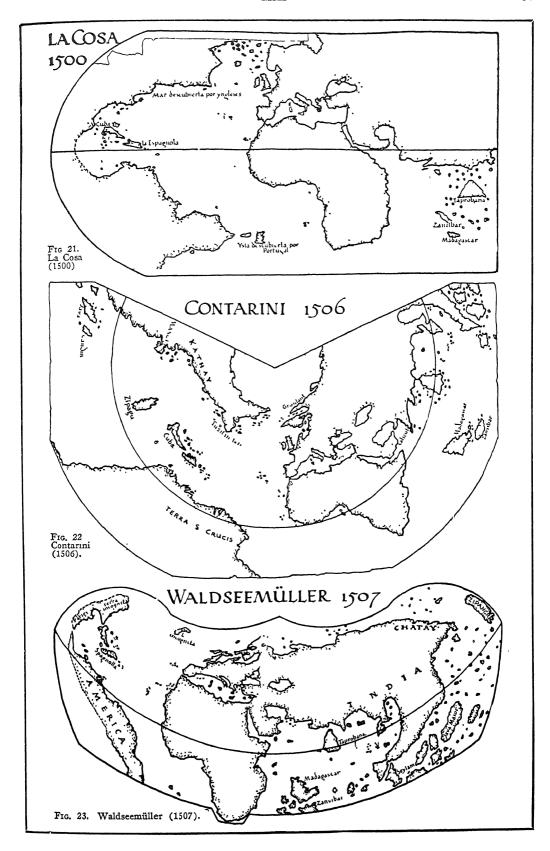
tion became a national industry.

The early explorations and mapping of the rapidly expanding country were chiefly due to the army. William Clark's map of 1810 of the Lewis-Clark transcontinental expedition; Major Stephen H. Long's map of the Platte River; Benjamin L. E. Bonneville's map of the Great Basin; Joseph N. Nicollet's map of Minnesota; John Charles Frémont's map of the West are just a few witnesses to the outstanding work of these men under constant danger from Indians.

The westward migration of people was pre-ceded by the host of surveyors commissioned by the General Land Office to make township plots. These men did remarkable work in incredibly short time, but often characterized more by speed than accuracy.

The Coast Survey was established in 1807 under the directorship of Ferdinand Hassler of Switzerland; the first charts, however, did not appear until 1845. This office is responsible for the leveling and triangulation of the country, and since 1878 it has carried the name United States Coast and Geodetic Survey.

The many competing surveys of the West were collected in 1878 into the United States Geological Survey, which is in charge of the



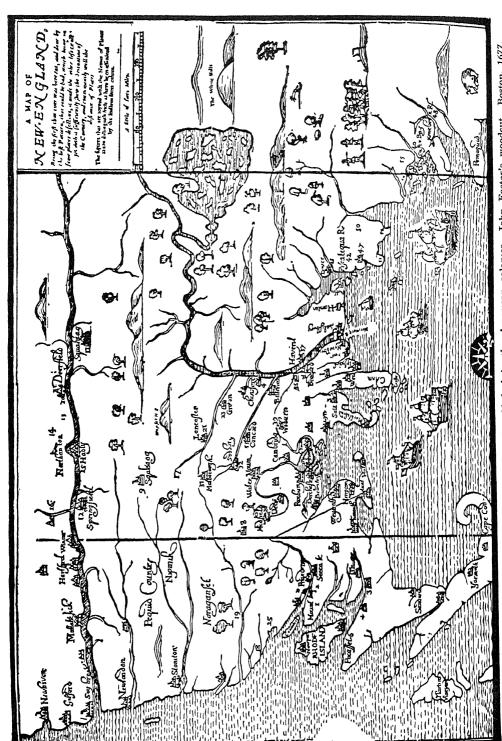


Fig. 24. The first map drawn, engraved, printed and published in the American colonies. John Foster's woodcut, Boston, 1677.

topographic mapping of the country. At the beginning of the Second World War less than half of the country was topographically surveyed. The coverage, however, was greatly expanded by the United States Corps of Engineers in recent

years.

Before the war, 24 federal agencies in Washington alone produced all kinds of special maps. Add to this the maps of the various local and state agencies, the number of official maps produced yearly runs into the hundred thousands. Even this production was superceded during the war, when the Army Map Service, the Coast and Geodetic Survey, and the navy produced maps especially of foreign countries with unprecedented speed. Much of this work was aided the creating photography.

by airplane photography.

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MAPES, māps, Victor, American play-wright: b. New York, 10 March 1870. He was wright: b. New York, 10 March 1870. He was graduated from Columbia in 1891, was dramatic critic of the New York World 1898-99 and manager of New Theatre Chicago (1906-07). He wrote Duse and the French (1897); Partners Three (1909); Gilded Way (1911); and directed The Tory's Guest (1900); Don Caesar's Return (1901); The Dectective (1908); The Boomerang (with Winchell Smith, 1915); The Amethyst (1925). D. 27 Sept. 1943.

MAPLE, a genus (Acer) of trees, together with a few shrubs of the family Aceraceae. The species, of which there are about 100. are

The species, of which there are about 100, are indigenous to the north temperate zone, being best represented in China, Japan, United States and Canada. They are characterized by opposite, palmate or lobed, exstipulate leaves; small polygamo-dioecious flowers in axillary corymbs or racemes; and compound, one- or twoseeded, long-winged nuts (samaras). The maples constitute one of the most widely useful genera of trees, being extensively employed for ornamental and street planting and for windbreaks, while the wood serves well for toolhandles, furniture, flooring and many other purposes. The flowers are rich in nectar and are sought by bees. Most of the species thrive best upon rich moist land suitable for agricultural purposes and are considered an indication of the type of soil A few grow in wet land, and many upon mountain sides. They are readily propagated by means of seeds which, in the case of the early maturing kinds, should be sown as soon as ripe, the later ones in autumn or spring, being stratified in sand during the winter. Some choice varieties are grafted or budded and others may be increased by cuttings and layers.

In America, the best known, most widely planted and otherwise most important species is probably the rock or sugar maple (A. sactree, often attaining heights of 120 feet. It is especially characteristic of rich woods from Maine to Michigan and southward in the mountams to Georgia, everywhere being noted for the rich colors of its leaves in autumn. Besides great popularity for all the purposes mentioned above, some of the trees are highly prized for their wavy-grained wood, which, being of satiny appearance and capable of high polish, is used under the name of curly maple often as veneers for choice furniture. It is further the most important of the species which yield a saccharine sap, and is a chief source of maple syrup and sugar, to obtain which the trees are "tapped," the sap caught in buckets and evaporated. A yield of three pounds per tree annually is considered very profitable; six pounds or even more is often obtained from many specimens whose sap is either especially abundant or particularly rich in sugar. If properly done no injury results to the trees. A form of the sugar maple, the black maple (A. saccharinum var. nigrum), so called from its very dark bark, is considered a distinct species (A. nigrum) by some botanists It has the same range and habitats as the pre-ceding and in nearly every respect the same uses, including sugar production. This form is more abundant than the preceding in the Central States.

The silver maple (A. saccharinum) is a widely spreading tree which attains a height of 120 feet throughout the same range as the above species. Being very ornamental in form and particularly also because of its graceful leaves, which are silvery white beneath, this tree is widely planted where rapid growth and quick effects are desired. Its chief fault is its brittleness; it quickly succumbs to high winds. It will succeed upon a wide variety of soils. Its sap, though rather sweet, is less useful for sugar than the above-mentioned species.

The red, scarlet or swamp maple (A. rubrum) attains heights similar to the above, has about the same range, but is most frequently found in wet ground. It is named from the brilliant color of its flowers, which are borne profusely in early spring before the leaves appear and from its red fruits which appear soon after. Being of good habit it is widely planted for ornamental purposes upon all kinds of soils. Its wood is used for most of the purposes enumerated above.

The Norway maple (A. platanoides) is somewhat smaller than the preceding species, (A. platanoides) being more compact and umbrageous. It is widely planted in private grounds and in parks, but is less valuable for street planting than the above because of its shorter trunk. It is a native of Europe. The sycamore maple (A. pseudo-platanus), another European species, is smaller still, attaining only about 70 feet. It is also widely planted in America as well as in Europe, being a vigorous, rapid grower and succeeding upon a great variety of soils. The common maple (A campestre) occasionally attains 50 feet, but is usually a smaller tree or even a shrub. It is of European origin and is widely planted

The Japanese maple (A. japonicum, A. palmatum and other species) are small trees or shrubs which because of the great diversity of form of their leaves and their dainty habit have become widely popular in the parks and gardens of the United States and Europe. Their exceptionally brilliant autumnal coloring is taken advantage of in Japan where in the fall

they approach the chrysanthemum in popularity.

The maples furnish food for a large number of insects, some of which live upon the green parts and others upon the wood. Several species of scale insects (q v.) are often abundant enough to do considerable damage The cottony maple scale (Pulvinaria innumerabilis), Pseudococcus aceris, a European insect, and the "gloomy" scale (Aspidiotus tenebricosus), a southern species, are among the most troublesome. Several caterpillars live upon the leaves, the forest tent caterpillar (Malacosoma dis-stria), the fall web-worm (Hyphantria cunea), and the larvæ of the tussock moth (Orgyia leucostigma), being the most generally important. The maple worm (Amsota rubicunda) is frequently very destructive. It is the larva of a moth. Of the borers, the larvæ of Dicerca divericata and Glycobius speciosus, which are beetles in the adult state, and those of Ægeria acerni, a clear-winged moth, are among the best known. The second beetle mentioned is known as the sugar maple borer. Consult Bailey, 'Standard Cyclopædia of Horticulture' (New York).

MAPLE SUGAR INDUSTRY, a trade term, in common use, pertaining to the manufacture of sugar and syrup from the sap of rock or sugar maple, Acer saccharum. This production is classed under "Agriculture" by the United States Census Bureau, and note was made of its importance at a very early day in the history of the government. The product is strictly confined to North America and the greater part to more or less limited areas in each of the geographical divisions known as New England, Middle Atlantic and Central-Western States, and Canada bordering on the North. Ten States—Maine, New Hampshire, Vermont, Massachusetts, New York, Pennsylvania, Ohio, Indiana, Michigan, and Wisconsin—produce approximately 97 per cent of all the maple sugar and maple syrup produced in the United States. New York and Vermont are the leading producing States. According to the U. S. Department of Agriculture, the output of maple sugar and of maple syrup, expressed in terms of sugar, was as follows: 1917-20 average—43,155,000 pounds; 1921-25 average—30,972,000 pounds. Production in 1937 totaled 990,000 pounds of sugar and 2,562,000 gallons of syrup, these two items bringing the total cash income for the year up to \$3,877,000 as against \$3,245,000 in

In Canada the manufacture of maple sugar and syrup assumed a relatively high importance

compared with the production in the United States. The Canadian production in 1937 was 4,413,147 pounds of sugar, and 1,232,069 gallons of syrup Of this aggregate Quebec is credited with 4,020,000 pounds of sugar and 780,000 gallons of syrup; Ontario with 231,427 pounds of sugar and 439,711 gallons of syrup. Smaller quantities were produced in other provinces—in Nova Scotia 45,240 pounds of sugar and 6,787 gallons of syrup, and in New Brunswick 116,480 pounds of sugar and 5,571 gallons

of syrup. History.—Maple sugar and syrup was made at an early day by the pioneers of New England and Canada It may have been a product of "necessity, the mother of invention," or an inheritance from the Indians, who had a spring-date of sugar-making moon, but, in either event, the first methods employed were crude, and the article was dark in color and not attractive. Moreover, tapping trees with an axe tended to denude the forest of its maples. and the whole modus operandi was wasteful in the extreme. The sap was caught in troughs, hewed out of logs, thence carried in pails to the boiling place and reduced to syrup in potash leattles. These lattles of the 19th carriers that the same of the 19th carriers are the same of the 19th carriers and the same of the 19th carriers are the 19th carriers kettles. These kettles of the 18th century, or earlier, would be a curiosity at this day. They were suspended by chains from a horizontal pole, supported by forked or crossed sticks at each end, and surrounded by a blazing open fire. The camp-kettle, captured from General Burgoyne at the battle of Saratoga, 17 Oct. 1777, preserved in the Bennington Battle Monument, is a fine illustration of what these kettles resembled Primitive ways, however, did not long continue. Improved methods, both as to tapping the maples,-leading up to the use of metal spouts,—and refining sap, followed one another, until now modern scientific principles prevail; and it is possible to reduce the sap to sugar or syrup, using evaporators, almost immediately, so that its color is nearly white, flavored only with the delightful aroma of the maple.

Adulteration.—Reliable authorities assert that prior to the passage of the National Pure Food and Drugs Act, and before the Federal Government inaugurated its crusade against misbranding, certain sugar refineries made much more sugar and syrup, labeling it «maple,» than the entire natural production. This practice, however, has been suppressed, and though much maple syrup is sold to concerns which blend it with cane syrup no attempt is made in marketing the product to deceive the public, the labels simply stating that the article within the container is a syrup made by blending cane and maple syrups.

MAPLESON, ma'pl-son, James Henry, English operatic impresario: b London, 4 May 1830, d there, 14 Nov 1901. He was educated at the Royal Academy of Music, London. In 1878 he toured America with an Italian opera and later toured with several great singers.

MAPLEWOOD, Mo., city adjoining St. Louis, of which it is a residential suburb. Government commission. Pop. (1930) 12,657; (1940) 12,875.

MAPLEWOOD, N. J., township in Essex County, alt. 134 feet, on the Delaware, Lackawanna and Western Railroad, 16m W. of New York. It is a residential suburb of New York and Newark, and has no important industries. Its government is administered by a township committee. It has a public library Pop. (1930) 21,321, (1940) 23,139.

MAPPA, Adam Gerard, Holland-American soldier and pioneer type founder b. Delft, Holland, date unknown, d Olden Barneveld, N Y, April 1828 As a young man he entered the military service of his native country, gaining «marked distinction as a brave and enterprising officer » About the time of his marriage (1780) he left the Dutch service and engaged in the business of type founding This business was interrupted by political storms which distuibed the province of Holland in 1786-87 Colonel Mappa again took up the sword and became one of the leaders of the Dutch Patriots, being commander of the armed citizens in the Province of Holland "After keeping The Hague in a state of alarm with his small band of patriots alone, he was overwhelmed with numbers." And on 9 Oct 1787 he was obliged to disband his men With 14 others he was banished forever from Delft.

At the request of his republican friends he went to the court of Versailles to solicit countenance and co-operation But Louis XVI had troubles enough of his own, and as the prospects of the civil liberty being established in his own country grew fainter, Colonel Mappa decided to move with his family to America. On 1 Dec 1789 they arrived in New York The 1 Dec 1789 they arrived in New York The time between his expulsion from Holland and his landing in America was spent with other Dutch political refugees at the Chateau de

Watte near Saint Omer.

While in Paris, Colonel Mappa became acquainted with Thomas Jefferson, then American Ambassador to France, who advised him to take to America a type-founding plant, there being then no such industry on the western side of the Atlantic Accordingly Colonel Mappa brought with him a complete "letter foundry" embodying not only the "Western but Oriental languages" as well. The outfit was valued_at something like £3,500 New York currency Up to this time all printers had been obliged to purchase their type in England or Scotland The following January (1790) Francis Adrian van der Kemp, a fellow 1 efugee, wrote to his friend, John Adams, then a political power and later President, suggesting that the Congress impose a tax on all foreign type to encourage and protect Mappa's infant industry.

Where he set up his type foundry at first it is perhaps impossible to say. A New York directory of 1792 makes mention of him as doing business at 22 Greenwich street. The infant industry was not prosperous as letters from Mrs Mappa to her friends plainly indicate. So on 1 Feb. 1794 he advertised his "type manufactory for sale." In the following summer, 1794, Colonel Mappa moved to Olden Barneveld, later Trenton, now Barneveld, and became the resident agent for the Holland Land Company, for more than 30 years until the time of his death. Here he built the stone mansion which still stands unharmed for the years and which in his day was often the gathering place of noted pioneer families of central New York.

MAPU, mä'pö, Abraham, Hebrew novelist: b. Kovno, 1808; d 1867 At an early age he became noted as a Talmudist He studied Latin and the classics of that language exerted a lasting influence on his literary endeavors. He was also well acquainted with French literature and in 1848 was appointed professor in a Jewish school at Kovno From this time dates his devotion to Hebrew literature. In 1852 appeared his novel 'Ahabat Zéyon' (Love of Zion), the forerunner of the romance movement in 19th century Hebrew literature. It became very popular although orthodox rabbis came very popular attnough orthodox raddis assailed it as a profanation of the Leshon Quodesh or Holy Tongue. In 1865 Mapu published another historical novel, 'The Transgression of Samaria.' In 1887 an English translation entitled 'Amnon, Prince and Peasant' was published by F Jaffe Other works of Mapu are 'The Hypocrite' (1859-69); Hebrew manual: Hebrew grammar and a Hebrew brew manual; Hebrew grammar, and a Hebrew textbook for the study of French. Consult Slouschz, N., 'The Renaiscence of Hebrew Literature' (1909)

MAPURITO, mä-poo-re'to, one of the Mexican white-backed skunks See Skunk.

MAQUI, ma'kē, an evergreen shrub of the family Elaocarpacea, found in Chile, from the juice of whose acid fruit the Chileans make a wine given to persons ill with a fever Its wood is employed in making musical instruments and its bark furnishes strings for them. It is the best-known species of the genus Aristotelia (A. maqui), and is cultivated as an ornamental shrub in Europe

MAQUOKETA, ma-kō'kē-ta, Iowa, city, county-seat of Jackson County, on the Maquoketa River and on the Chicago, Milwaukee, St Paul and Pacific and the Chicago and North Western railroads, 42 miles north of Davenport. It is in an agricultural section; valuable limestone quarries are in the vicinity and not far distant are forests which furnish excellent hardwood timber. Its chief manufactures are flour, lime, woolen goods, brick, tile, foundry and machine-shop products and wooden-ware. It has an extensive trade in manufactured articles, farm products and livestock It has county buildings, several churches and schools and the Boardman Library Institute There are two semi-weekly newspapers and good banking facilities. The city owns and operates the waterworks. Pop 3,595

MARA, mä'ra, in old Runic, a goblin that seized on men asleep in their beds and took from them all speech and motion In Russian it was called kiki-mora, or ghosts. In Hindu mythology Mara is the ruling spirit of evil; the tempter mentioned by Edwin Arnold in his 'Light of Asia' Mara is also frequently identified with the incubus and with nightmare (qq.v.)

MARABOU, măr-a-boo', a large African pink-white pouched stork (Leptoptilus crumenifer), which resembles the adjutant (q.v.) of India in appearance and habits. It gives its name to the soft and drooping feathers (coverts) which cover the root of the tail and are prized for millinery and other ornamental purposes; a large part of the "Marabou feathers" sold, however, are derived from the Indian adjutant.

MARABOUTS, mar'a-boots, MARABOOTS, or MARABUTS, Mohammedan Arab hermits or devotees, leading a secluded religious life or occupying a religious station in northern Africa. They have great influence among the Berbers and distribute amulets, affect to work miracles and are thought by their followers to exercise the gift of prophecy. Throughout the Barbary States the tombs of the Marabouts are conspicuous objects, being generally built in the open country and regarded by the people with much reverence. Some of them have degenerated into religious tramps.

MARACAIBO, ma-ra-kī'bō, Venezuela, capital of the state of Zulia, situated on the strait that connects Lake Maracaibo with the Gulf of Venezuela It has a large and safe harbor, and maintains commercial relations with foreign markets, with the interior and with Colombia Hundreds of small craft, suitable for shallow waters, carry on the trade of the coast and rivers tributary to the lake The most important buildings are the Executive Mansion, the public market, Legislative Palace, municipal building, Baralt Theatre, university, churches and the prison. The public plazas contain statues of the patriot, Gen. Rafael Urdaneta, and Don Rafael Baralt, author of a history of Venezuela, who was born in Maracaibo and became a member of the Paral Spanish Academy. These in the Paral Spanish Academy. These in the Paral Spanish Academy. ber of the Royal Spanish Academy. There is a dockyard for the construction of sailing-vessels and the city has electric lighting, telegraph and telephone service, submarine cable, street railways, etc. In the last few years rich deposits of petroleum have been found along the shores of Lake Maracaibo, which has resulted in increased activity in the city, and made Maracaibo one of the most important petroleum export centres of Latin America. Petroleum, coffee, cocoa and hides are the chief exports, which have an average annual value of \$2,300,000. Maracaibo, at first called Nueva Zamora, was founded in 1571 by Alonzo de Pacheco. This city is the starting point for passenger and freight steamers and rail lines. Pop. about 110,000.

MARACAIBO, Gulf of. See Venezuela,

GULF OF.

MARACAIBO, Lake of, Venezuela, in the northwestern part, connected with the Gulf of Venezuela by a strait about 50 miles long and from 8 to 15 miles wide. The lake lies between 9° and 11° N. lat. and 71° and 72° W. long., and is about 100 miles long from north to couch and 80 miles across the widest part. south and 80 miles across the widest part. At the mouth it is about 500 feet deep, but at its head it is shallow and the land near the shore is marshy. Large vessels cannot enter because of a bar at its mouth which leaves only from 8 to 13 feet of water. A number of rivers flow into the lake and keep it fresh, but when strong north winds prevail it be-comes brackish. The tides do not affect the lake to any very great extent although it is a marine inlet. It was once much larger than at present, as the shore-marks indicate, but the basin has been filled in. Petroleum deposits have been discovered along its shores and are being extensively developed. See Venezuela.

MARAJO, mä-rä-zhō' (called also Joannes), Brazil, an island at or between the deltas that form the mouths of the Amazon and Para rivers; area, about 14,000 square miles. From

east to west the greatest dimension is 162 miles and 110 miles north and south. The greater part is low; in the centre are several lakes In the north and west are swamp lands and in the cast and south forests, the rubber tree predominating. The chief settlement is Saure on the eastern coast There are not many residents, as in the rainy season nearly the whole island is flooded Cattle raising and gathering rubber are the chief occupations.

MARAL, the red deer of Persia.

MARANHAM, ma-ran-yan, or MARAN. HÃO, Brazil, a maritime state, just south of the Equator, bounded on the north by the Atlantic Ocean; area, 177,515 square miles. The surface is uneven, but there is no range of mountains There are numerous rivers flowing into the Atlantic, large forests, extensive plains where cattle are reared; the climate is fine and the soil fertile. The Paranhyba is the principal river, being 700 miles long, with several large tributanes The Gurupy, the Mearim and the Itapicurú are each about 500 miles in length Agriculture has only begun; the emancipation of the slaves, on whose labor the state had depended, was followed by a period of great depression Cotton, sugar and rubber are the principal products. Coffee, rice, corn, cacao and tropical fruits grow luxuriantly. The population is not great enough to properly develop the rich natural resources, there being only 49 persons to the square mile. Efforts are being made to colonize different sections, but the hot climate is not attractive. The present inhabitants are chiefly of Portuguese descent; but there are about 20,000 Indians and a few hundred negroes and mulattoes. The capital is Maranham. Pop. about 1,200,000.

MARANHAM, or SÃO LUIZ DE MA-

RANHAO, san loo-ezh' do ma-ran-yan', Bra-zil, capital of the state of Maranham, on an island on the bay of São Marcos and between the mouths of the Itapicurú and Mearim rivers. The first settlements were made by the French in 1612. The ground is low and the climate warm but the place is healthful. The harbor, once good, is filling with sand, and little or nothing is done for its improvement. It has considerable trade, the imports and exports totaling \$600,000 annually. The chief exports are cotton, sugar, hides, rubber, cotton-seed and the skins of goats Wool is woven and rugs and felt manufactured The chief imports are machinery and clothing. The city has many fine buildings, public and private. Pop. including the suburbs, about 60,000.

MARANHÃO. See MARANHAM:

MARASCHINO, măr-ăs-kē'nō, or MAR-ASQUINO, a fine liqueur prepared from the sour cherry of southern Europe (*Prunus mahaleb*). The best-known kinds come from Dalmatia and from Corsica. There are other brands that use the name.

MARASMUS, a vague term denoting general emaciation or atrophy with no special cause apparent; now used in relation to the wasting of infants due to malnutrition combined with unhygienic surroundings See Children, Dis-EASES OF.

MARAT, Jean Paul, zhŏn pōl mā-rā, French revolutionist b Boudry, Neuchâtel, Switzerland, 24 may 1744; d. Paris, 13 July 1793 He

studied medicine in Paris, traveled widely and practised in London and later in Paris The first breath of the Revolution converted the industrious doctor into an audacious fanatic and demagogue. He succeeded, by his violence and energy, in commanding attention Danton in-stituted the club of the Cordeliers and collected around him all the fiercest spirits; among the number, Marat, who became the editor of the Publiciste Parisien, better known under its later title L'Am du Peuple, again changed to the Journal de la Republique Française This sheet was the oracle of the mob Denounced to the Constitutional Assembly and proceeded against by the municipal authorities of Paris, he contrived to escape to London and was later in hiding in Paris During the existence of Legislative Assembly he continued his outrages, figured among the actors of 10 August and in September (1792) He in hiding in Paris During the existence of the the assassination of September (1792) He was a member of the Committee of Public Safety to the convention and made the Ministers, General Dumouriez and the Girondists, the objects of his attack Being charged in the convention with demanding in his journal 270,-000 heads, he openly boasted of that demand and declared that he should call for many more if those were not yielded to him. The establishment of the revolutionary tribunal and of the committee for arresting the suspected was adopted on his motions. On the approach of 31 May, as president of the Jacobin Club, he signed an address instigating the people to an insurrection and to massacre all traitors. Even the Mountain party denounced this measure and Marat was delivered over to the revolutionary tribunal, which acquitted him; the people received him in triumph, covered him with civic wreaths and conducted him to the hall of the convention His bloody career was closed by assassination (See Corday D'Armans, Charlotte). His remains were placed in the Pantheon, whence they were later removed. Chevremont, 'Jean Paul moved Consult Marat' (1881); Bat, 'Jean Paul Marat, the People's Friend' (1901); Velay, C., 'Correspondance de Marat' (Paris 1908).

MARATHI. See MAHRATTAS

MARATHI LANGUAGE AND LITER-ATURE. Marathi is one of the principal vernaculars spoken in India It bears a close affactuars spoken in India 11 beats a close ar-finity to Sindhi and Gujerati and is spoken by about 20,000,000 people There are several dia-lects of it, named, respectively, Konkani and Dakhani. The latter is the standard dialect and circulates in the Deccan, the former in the coast region of the Mahrattas and shows a large admixture of Dravidian, while in the district around Goa (a Portuguese possession) it also contains many Portuguese expressions and Besides, Marathi as a whole has a rather strong infusion of both Arabic and Persian words. All the same, modern Marathi has departed less from the original Sanskrit than most other Prakrits, being a direct descendant from the Maharastri of the Middle Ages. A stock of its vocables are taken from Sanskrit itself, the so-called tatsamas. There are three genders in Marathi, the only one of the Prakrits that has retained this feature of Sanskrit. Konkani literature was destroyed by the Portuguese inquisition.

Marathi literature is abundant. It took its

inception with Namdev in the 13th century, who wrote descriptive and didactic poems of a religious cast. Tukaram, the most famous of Marathi writers (AD 1609), published writings showing Vishnuic convictions Mayur Pandit in the 18th century also wrote many poems, epic, lyrical and descriptive Marathi lends itself most readily to rhyme, and there are current

most readily to rhyme, and there are current among the Marathi people many rhymed proverbs, both pithy and fanciful. In prose not much of consequence has been produced

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WOLF VON SCHIERBRAND.

WOLF VON SCHIERBRAND.

MARATHON, măr'a-thon, Greece, an ancient village in Attica, about 20 miles northeast of Athens It was situated on a plain which extends for about six miles along the sea shore, with a breadth of from one and a half to three miles. The site of the ancient village was not probably that of the present Marathona, but at a place now called Vrana, a little farther south Through the centre of the plan runs a small brook Here was fought the great battle between the Athenians and Persians, 490 BC. (See Miltiades) A tumulus or «soros» on the plain marks the burial-place of the Athenians who died in battle It was excavated by the Greek Archæological Society in 1890-91, and yielded many interesting relics.

MARATHON RACE, an athletic contest commemorating the feat of Pheidippides, Greek Olympic runner, who in 490 BC, ran from Marathon to Athens to carry news of the defeat of the Persians by Athenians and Spartans and fell dead as he cried: "Rejoice, we conquer." The distance run was 22 miles. The modern race, feature of Olympic games since 1896, is for a distance of 26 miles, 385 yards For modern records see OLYMPIC GAMES, SPORTS, THEIR DEVELOPMENT, SPEEDS AND RECORDS.

MARATTI, mä-rat'tē, or MARATTA, ma-rat'ta, Carlo, Italian painter and engraver: b Camerino, 13 May 1625; d. Rome, 15 Dec. 1713 While a child he amused himself with painting all sorts of figures drawn by himself on the walls of his father's house. In his 11th year he went to Rome, studied the works of Raphael, of the Caracci and of Guido Reni in the school of Sacchi, and formed himself on their manner. His Madonnas were particularly admired. Louis XIV employed him to paint his celebrated picture of Daphne. Clement IX, whose portrait he painted, appointed him over-seer of the Vatican Gallery We are much in-debted to him for the preservation of the works of Raphael in the Vatican and of the Caracci in the Farnese Palace He also erected monuments to those masters in the church Della Rotonda. As an artist Maratti deserves the title given him by Richardson, of the "Last Painter of the Roman School »

MARATTIALES. See FERNS AND FERN-

MARAVEDī, măr-a-vā'dǐ, the lowest denomination of old Spanish copper coins in use from 1474 to 1848, varying in value from oneseventh to one-third of a cent. There were also, at an earlier period, maravedis of gold

weighing 60 grains

MARBEAU, Jean Baptiste Firmin, zhŏn ba-tēst fēr-mān mar-bō, French philanthropist, founder of the day nursery b Brives, 18 May 1798; d. Saint Cloud, 10 Oct. 1875 He practised law in Paris, and in 1841, being deputed to inspect the charitable institutions of the first arrondissement of the city, planned the crèche or day nursery for the care of children of working mothers The first crèche was opened 14 Nov 1844 at Chaillot; a Société des Crèches was founded in 1846; and his plan was described in his book, 'Des Crèches' (1845). · Marbeau played a less prominent part in other charities and wrote on various problems of pauperism. Consult the 'Life' by Roussel (1876)

MARBLE, mar'bl, Manton, American journalist: b Worcester, Mass, 16 Nov 1834; d. Maidstone, England, 24 July 1917. He was educated at the Albany Academy and the University of Rochester, being graduated from the latter in 1855. After spending seven years in the employ of Boston and New York newspapers he bought the New York World, on the staff of which he had been employed from 1858 to 1860. Marble was engaged in a controversy with President Lincoln concerning the publication of certain dispatches in the World latter journal was temporarily suspended from publication. Marble was one of the first to iecognize and give publicity to the writings of Herbert Spencer. In 1885 President Cleve-land sent Marble to the British, French and German governments as special envoy to discuss the subject of international bimetallism. On his return, after conferences with various European authorities, he advised the President that upon the co-operation of the United Kingdom, for which neither Tory nor Liberal leaders were prepared, depended the German and French resumption of free bimetallic coinage, and advised that United States purchase of silver should cease Marble was one of the founders of the Manhattan Club and at one time the president of that organization. He belonged also to many literary and scientific societies, among them the Century Association, the Round Table, the Cobden Club and Metropolitan Club. He was the author of 'Letter to Abraham Lincoln,' 'The Presidential Counts,' 'A Secret Chapter of Political History' and a memoir of Alex. G. Mercer, which prefaced his 'Notes of an Outlook on Life'

MARBLE (from the Greek marmairein, to sparkle), a compact rock which, in its pure form, is composed entirely of carbonate of lime or limestone. In its best form it is a variety of calcite, the tiny crystal facets sparkling and flashing in the sun's rays; hence its ancient name. It is seldom found in perfect purity, the tractable qualities of the limestone allowing the introduction of many foreign substances during its formation. Thus there will be seen marble with streaks of various colors tunning through it, caused by the action of oxide of iron or other chemicals. Almost any limestone rock is commonly called marble, even certain varieties of granite, onyx, porphyry and rock largely composed of gneiss and mica-schist. True marble is a metamorphic equivalent of limestone,

from which it has been produced by heat or pressure, or both

Marble has been a favorite stone for form, ing into statuary and for decorative work in buildings and monuments, from the very earliest ages. The Greeks, who were the first to endow this lifeless stone with marvelous genius in their statuary and bas-reliefs, were blessed with an almost inexhaustible supply of the very finest and purest marble yet discovered, on the island of Paros, in the Ægean Sca. This marble, so celebrated as "Parian," possesses a peculiar waxy attribute which gave the statues formed from it a beautiful polish. The 'Venus de Medici' was made from this stone, which is almost perfectly white. The Parthenon was built of marble of Pentelicus, which was a little more finely grained. The marbles of Carrara were even then known but not generally put in use till later years, being still among the finest marble in the world, though having some gray streaks.

In many other parts of Continental Europe and in Great Britain are quarries of fairly pure America has a large supply of this marble useful stone. Each year new occurrences of it are found in the Rocky Mountains, some of them pure white, others with variegated colorings. Perhaps the finest example of these wonderful marbles of the Rockies is found in the new State capitol building of Colorado, at Denver. In the eastern part of the United States there are many quarries of marble which have been in use for many years. Vermont is probably the seat of the largest quarries Little of this marble is finely grained and white enough to answer for the sculptor's use, but it is admirably adapted for ornamental purposes in architecture and for monuments for the dead. American sculptors still generally use the marbles from Carrara, though the merits of the American product are becoming known mont, although one of the smallest States in the Union, exports more stone for commercial purposes than any other State, except one, Pennsylvania standing first. The money value of Vermont's stone product is approximately \$10,000,000 a year, a large part of it being in marbles of various grades.

The quarrying of marble is now carried on extensively, the use of machinery largely taking the place of the ancient hand methods Fifty years ago the quarries of Rutland, Vt., still the largest in the world, were operated by ox teams and hand work of the crudest form. To-day, these vast quarries have an extensive outfit of electric cranes and derricks, which move the blocks of marble in any desired direction, easily and quickly, one of these traveling cranes having a carrying capacity for 100,000 pounds. The stone is too easily broken to permit the use of blasting powders of any kind This method is used in some of the Italian quarries, but causes great waste of material and is most unsatisfactory. In the Vermont quarries, a machine called a "channeler" has been found the best for economical work and has been exclusively adopted. It consists of a row of long chisels set in a strong, traveling framework. This gang of chisels vibrate up and down, cutting a channel in any direction desired in the face of the mar-ble ledge The channel can be made any reasonable depth, according to the size of block desired. When this channel, or groove, is suf-

ficiently long and deep, the machine is reversed and cross channels are cut and the bottom per-Then wedges are carefully driven in behind the block of stone and it gently falls over, to be lifted by a crane to the railroad cars or to that part of the quarry devoted to further treatment of the output. As a rule, the stone is sent in its rough state to the purchaser, who dresses it himself. When the order is for monument work or some special design in architecture, the marble is treated at or near the In thus further treating the product, a mnarry toothless saw, or gang of saws, is used. The block of stone is placed on a horse, or platform, and the saws set at work, the size of the cut being gauged by setting the saws close together, or far apart, as needed. A stream of water in which is mixed sea sand or other sharp, hard sand, falls upon each saw. The friction of the iron blade, aided by the sand and water, quickly cuts up the marble into any desired shape. Some marble cutters use saws of wire, but the best seem to be those made of strips of soft iron one-sixteenth of an inch thick and, when new, four inches wide. The marble wears down one of the saw blades very When the blocks are thus sawn into the requisite shapes by the power gang-saws, they are then placed on tables and ground down to size, a small piece of marble being rotated over them by hand or power, water flowing over the surface being ground. With surprising facility, the marble yields to this treatment. Polish, in the final stages, is given by rubbing with wood or other soft material, and finally cloth. Much hand work is, of course, necessary with the mallet and chisel and polisher, but all the rough, heavy work, which formerly made marble so costly and hard to obtain, is now done entirely by electric and steam power One of the finishing rooms at the Rutland works, located at Proctor, Vt., is 1,000 feet long and contains scores of giant gang saws, cutting up the marble into various shapes This plant, one of the largest in the world, has an output of \$3,000,000 annually and employs hundreds of Most of this output is of white marble, though brown, gray, green and other shades are found in profusion

One ancient method of mining this delicate stone, still used entirely by the Mexicans in mining onyx, is to drill holes in a line, insert plugs of some porous wood, pour in water and allow the wood to swell. This gently forces the precious stone free, without the least injury.

One quality of marble, not usually recalled, is its ability to withstand great heat safely. In the devastating fire in 1903 at Paterson, N. J., buildings built of granite crumbled and perished. Those of marble still stand, almost as good as ever. Its use is, therefore, becoming more and more general in erecting fireproof buildings in the large cities, the floors and often the entire inside wall and ceiling being overlaid with it.

Some really fine examples of craftsmanship in this line are found in the public buildings of New York City and elsewhere in America, notably the new buildings of the Hall of Records and the Appellate Division of the Supreme Court, in New York. In the making of monuments for the dead, marble is most extensively used. The floors of bathrooms, tops of toilet tables, basins for washing hands and clothes, tiling of various sorts—all these and a thou-

sand other household purposes find in marble their chief exponent. Probably more than \$75,000,000 worth of finished marble products are used in the United States annually, made from domestic quarries entirely. See also Rocks.

MARBLE FAUN, The. The 'Marble Faun' was begun by Nathaniel Hawthorne during his visit to Italy in 1858 and was published in 1860 in 1860 In England it was issued as the 'Transformation' The scene is laid in Rome, but two of the four chief characters are Americans. The most interesting person in the story, however, is Donatello, a young Italian of noble birth who bears a strong resemblance to the statue of a faun by Praxiteles, and who, according to a tradition in his family, numbered a faun among his early progenitors. There are two women characters, of different types. Miriam is of a rich, full-blooded nature, and her past is bound up with some terrible mystery. Hilda, who is said to have been drawn with the writer's daughter in mind, was evidently intended as an example of the pure and self-contained New England maiden, but she has been aptly characterized by one critic as an "admirable little icicle" The romance is a study of the effects of a great guilt on these persons, and especially on Donatello, in whom it brings about the change referred to in the English title of the book Hawthorne here seems to be considering the great question of the mission of sin in the world, but in the end the explanation which he allows one of the characters to suggest he makes Hilda reject with horror. The romance has serious techni-cal defects. It contains an excess of traveler's descriptions, which, however excellent in themselves, have little to do with the story; and it fails to satisfy the curiosity which the author persistently arouses regarding Miriam's past. Dissatisfaction with the ending was so great that in a later edition the author added a chapter of explanation, which, however, he justly regarded as no improvement. The chief merits of the book lie in the conception of Donatello, in the elusive symbolism and suggestiveness which characterize all Hawthorne's best work, and in several impressive scenes Some of these, like the meeting with the model in the cata-combs and the visit to the church of the Capuchins where the murdered monk lies, have a more dramatic quality than is usual with Haw-

WILLIAM B. CAIRNS.

MARBLED GODWIT. See GODWITS. MARBLED TIGER-CAT. See TIGER-

MARBLEHEAD, Mass, town in Essex County; alt. 15 feet; on Massachusetts Bay; 17m. NE. of Boston; on the Boston and Maine Railroad, included, under Salem, as a port of entry, 4th United States Customs District The town is located on a double peninsula, with Point Light on the SE. projection, the «Neck.» There are yacht piers and a public landing. Fishing and boatbuilding are carried on, and Marblehead is one of the Atlantic coast's best known yachting centers; it also has many fine summer homes. In the middle decades of the 19th century the town bade fair to become an industrial city, making shoes, glue, rope, barrels,

and paint, but cities more strategically located captured the business. Marblehead has many old houses of historic interest. Abbot Hall contains the town administrative offices and the public library. In it is preserved the original of the famous painting by Archibald M. Willard (qv), 'The Spirit of '76' The local art association has quarters in the old Town House (1727), and the historical society maintains a museum in the Jeremiah Lee mansion (1768). Settled in 1629 by fishermen from Guernsey and Jersey (compare Whittier's poem 'Skipper Ireson's Ride'), the town was until 1649 a part of Salem In the Revolutionary War Marblehead privateers, the Hannah and the Lee, rendered noteworthy service. Pop. (1940) 10,856.

MARBLES AND MARBLE PLAYING. Marbles are small balls of baked clay, marble, agate or spheres of glass, used as toys and play-things for children They are manufactured in large quantities in Saxony for exportation to the United States and to India and China. They were also largely manufactured in the agate mills at Oberstein on the Nahe, in Germany, for the American market. The material used in Saxony is a hard calcareous stone, which is first broken up into square blocks with a hammer. These are then thrown 100 to 150 to-gether into a mill, which is a stationary flat slab of stone, with a number of concentric furrows upon its face. Over this a block of oak of the same diameter, partially resting upon the small stones, is kept rotating, while water flows upon the stone slab. In 15 minutes the marbles are worn completely round and are fit for sale. An establishment with three mills will manufacture 60,000 marbles in a week Agates are made into marbles at Oberstein by first chipping the pieces nearly round with a hammer and then wearing them down upon the face of large grindstones.

The game of marbles is variously played; usually with a circular ring marked on the ground, the player taking one marble between the thumb and forefinger and dexterously shooting at other marbles within the circle, striking them with sufficient force to throw them outside the limits of the ring. This form is called ring-taw, and the marbles placed in the ring are apt to be clay ones, called "commys," which is probably short for "commons." A larger and better grade of marble is used for the "shooter." When a player misses a shot, it is then the turn of his opponent. Sometimes he also loses his of his opponent. Sometimes he also loses his turn when he drives his shooter outside of the ring. Play is often for "keeps," each boy winning what he knocks out. Another game of marbles is called "nine holes," though it may be played with a less number of holes. A row of small cup-shaped depressions are made in the ground, and the object is to toss or bowl one's marble into each hole in succession, the one accomplishing it with the fewest plays winning. Very likely golf had its fundamental idea in this simple game of marbles. In a variant form the boys shoot at other marbles to knock them into the holes, but their own shooter must not follow, under forfeit, suggesting the basic princi-ple of the game of pool "Hit and span" is an-other game much played. One player tosses his marble to a distance, and the other player tosses his marble as close to it as he can; if he hits it, it is keeps; if he comes within a handsbreadth or span he makes a hit and scores one. Then

they reverse, and his opponent tries, the one making the most hits or points winning This game can be played in walking along a country road, and appears to have been invented by boys who wanted to play on their way to school In some games of marbles it is fair to toss or bowl the shooter; and in others the player must touch the large knuckle of his forefinger to the ground when shooting, and this the boys call "knuckling down fairly" These games are subject to infinite change, according to the whim of the boys of a locality who play them They make their own rules and pass them along to the smaller boys as they grow up Girls seldom play marbles and adults are not supposed to play at all Marbles can be played indoors in bad weather, one way being for the players to sit on a carpet, with their legs apart, so as to stop the rolling maibles; one places a marble between his feet and the other player shoots

MARBLING, in bookbinding, the process of coloring paper or the edges of books, in imitation of the veining of variegated marble In the case of a book, after the volume is formed, but before the cover is put on, the book leaves are trimmed and tied between two boards and taken to a trough or vessel, perhaps two inches deep, which is filled with clean gum water rious colored pigments, ground in spirits of wine and mixed with a small quantity of oxgall, are thrown upon the surface of the gum water, and disposed in various forms with a quill and comb, forming a variegated, marble-like pattern. When satisfied with the coloung mixture, the workman dips the edges of the book into the trough, and the colors adhere. Cold water is then dashed over the edges, to set the colors and bring them out clearly Sometimes single leaves are marbled and placed just within the book cover, front and back, for ornamentation. Marbling was formerly quite common, but is now seldom used, solid colors, as red edges, being preferred, or gold edges. The deckle-edged book cannot be marbled, owing to its rough edges. See Bookbinding.

MARBURG, mar'boorg, Jugoslavia, town in Styria, 50 miles north of Zagreb, on the left bank of the Drave and on the Southern Railways, whose repair shops are a leading industry. Quantities of lumber, grain, wine and poultry are shipped. There are also shoe factories, cement works, flour mills and machine shops. Pop. about 23,000

MARBURG, Prussia, a town of Hesse-Nassau, on the slopes of an acclivity above the Lahn, 46 miles north of Frankfoit It dates from the 12th century. The principal buildings are the castles of the landgraves of Hesse, now partly used as a prison; the 13th century church of Saint Elizabeth; the town house and the celebrated Marburg University, founded in 1527, and having, in 1928, 164 professors and 3,293 students, and a library of 275,000 volumes. Here Luther and Zwingli debated on transubstantiation in 1529. It became a part of a Prussian province in 1866 The town has manufactures of machinery, leather, carpets, tobacco, pottery and toys. Pop. about 22,000.

MARBURY v. MADISON, a well-known decision in law handed down in 1803 by the United States Supreme Court. It is important as affording the earliest instance of the decla-

ration by the court that a Congressional statute is null and void by reason of its repugnance to the Constitution of the United States bury was appointed justice of the peace in the District of Columbia by President Adams, but the commission, though drawn up, signed and sealed, had never been delivered. Madison, when he became Secretary of State, refused to deliver it An act of Congress empowered the United States Supreme Court to issue to executive officers a writ of mandamus to force them to attend to their duties, and on the basis of this act Marbury brought suit Now the Constitution nowhere mentions the right to issue a writ of mandamus among the cases of original jurisdiction by the Supreme Court Chief Justice Marshall therefore decided against Mar-Chief bury, and his argument, admittedly the only accurate one, established an important precedent which is found only in the courts of the United

MARCABRUN, mar'ka-bren, a French troubadour: b in Gascony, about 1140, d. toward the end of the 12th century. He was a special favorite at the court of Alfonso VIII of Castile, where he seems to have been the chief of the royal troubadours. He was an extensive writer of love songs of which quite a number have survived to the present and have been printed.

MARCASITE, in mineralogy, an iron disulphide (FeS₂), differing from pyrites in that it crystallizes in the orthorhombic system. It was formerly known as white pyrites, cellular pyrites, cockscomb pyrites, hepatic pyrites or leberkies, etc. It is usually a pale yellow, being thus lighter than true pyrites, but it has gray to brown-black streaks. When arsenic is present it is known as kyrosite. It is often found in clays, but is far less common than iron pyrites

MARCEL, Etienne, ā-tē-ĕn mar-sĕl, French political leader: b Paris, 31 July 1358 From December 1355 he was provost of the Paris merchants and actual ruler of the city He put to death two officials of the Crown and finally persuaded the Dauphin Charles to act as regent while King John was held by the English. Not finding the Dauphin properly submissive, he obtained assistance from Charles the Bad of Navarre. He was killed during an uprising of the more wealthy and conservative citizens against his power. Consult Lazard, 'Un Bourgeois de Paris au XIVieme Siècle' (1890).

MARCELINE, mär-sĕ-lēn', Mo., city in Linn County; alt. 858 feet; 104m. NE. of Kansas City; on the Santa Fe Railroad. Railroading and mining have been its principal industries, but farming and food processing are advancing here. Walt Disney (see DISNEY, WALTER ELIAS) spent his boyhood years in Marceline. The city owns light and water supply systems. Pop. (1930) 3,555; (1940) 3,206.

MARCELLINUS, mär-sĕ-lī'nŭs, Saint: d probably 25 Oct. 304. He was a pope who succeeded Caius in 296 The Donatists alleged that during the Diocletian persecution he sacrificed to idols He was, however, vindicated by Augustine from this charge

MARCELLUS, mar-sĕl'ŭs, Marcus Claudius, Roman general b before 268 B.C; d. near Venusia, 208 BC In 222 being consul with Scipio he twice defeated the Insubrians in northern Italy, and with his own hand killed

their king, thus winning the spolia opima. After the disaster of Cannæ in the Second Punic War (216), Marcellus took command, gained several slight victories over the Carthaginians and hence was named "the sword of Rome," Fabius Cunctator being called "the shield of Rome." His third consulship (214) was spent in Sicily, where he attacked Syracuse, and after a two years' siege prolonged by the skill of Archimedes captured the city. In his fifth consulate after two years of varying success against Hannibal in Italy he was killed in a skirmish near Venusia

MARCELLUS I, Saint, Pope: d. 310. He succeeded Marcellinus and did not take office until 308. The Emperor Maxentius banished him from Rome for excommunicating an apostate and according to some authorities forced him to serve as a slave on the public highway. He suffered martyrdom under Maxentius.

MARCELLUS II (MARCELLO CERVINI, marchěl'lo chěr-vē'nē), Pope b in Tuscany, 6 May 1501; d Rome, 6 May 1555 He was cardinal legate at Trent of Julius III, whom he succeeded in the pontifical chair Although originally opposed to polyphonic music, he at once withdrew his opposition to it after listening to Palestrina's famous 'Missa Papæ Marcelli.' His pontificate lasted only 22 days

MARCELLUS STAGE, in geology, a term introduced by the New York State Geological Survey for the thin rock, mostly shale, which is the lowest group of the Upper Devonian System, and which is most typically seen in New York State at the little village of Marcellus, whence the stage is named.

MARCH, Alden, American surgeon: b. Sutton, Mass, 1795, d 1869 He was educated at Boston and at Brown University, receiving the degree of M D. from the latter in 1820 From 1825 to 1831 he was a professor in the Vermont Academy of Medicine, from 1831 to 1833 at the Albany Medical Seminary, and in 1833-34 at the Albany Medical School. In the latter year he founded a school of practical anatomy in Albany and in 1839 founded the Albany Medical College, in which he was professor of surgery from the foundation until his death in 1869 Dr. March also founded the Albany City Hospital; was president of the New York State Medical Society in 1857 and founded the American Medical Association. Dr March invented several surgical appliances and improved others. He published 'Wounds of the Abdomen and Larynx' (1854), and numerous papers in medical journals.

MARCH, Francis Andrew, American philologist: b. Millbury, Mass., 25 Oct 1825; d. 1911. He was graduated from Amherst in 1845, studied law in New York in 1849-50, was admitted to the bar in 1850, in 1856 became adjunct professor of belles-lettres and English literature in Lafayette College (Easton, Pa.), and in 1857 professor there of the English language and comparative philology. In 1873-74 and 1895-96 he was president of the American Philological Association, in 1876-1903 of the Spelling Reform Association and in 1891-93 of the Modern Language Association. He was among the earliest advocates of a historical study of the English language and of a philological study of the classic works of that language as the study of the classic works of that language as the study of the classic works of that language and of a philological study of the classic works of that language and of a philological study of the classic works of that language and of a philological study of the classic works of that language and of a philological study of the classic works of that language and of a philological study of the classic works of that language and of a philological study of the classic works of that language and of a philological study of the classic works of the cl

guage His contributions to the transactions and proceedings of the American Philological Association and other learned societies have been very extensive He was a consulting editor of the 'Standard Dictionary,' and decided many spellings and forms for that work He also edited the Douglass series of Christian Greek and Latin classics (1874-76), was director of the American readers for the great 'Historical Dictionary of English' of the London Philological Society, and published 'A Method of Philological Study of the English Language' (1865); 'Parser and Analyzer for Beginners' (1869); an 'Anglo-Saxon Grammar' (1870); an 'Anglo-Saxon Reader' (1870), an 'Introduction to Anglo-Saxon' (1871), 'Thesaurus Dictionary,' 5th edition, Philadelphia (1930).

MARCH, Peyton Conway, American soldier: b Easton, Pa, 27 Dec. 1864. He is a son of Francis A. March, the philologist Graduating from Lafayette College in 1884, he determined upon a military career, and graduated from the military academy in 1888. The same year he entered the army as a lieutenant of artillery. Later he graduated from the Fort Monroe Artillery School. When the Spanish War broke out he volunteered, and commanded the Astor Battery in 1898, the following year he was major of the 33d Volunteer Infantry. He served in Luzon, in the Philippine campaign, and received several promotions for gallantry He obtained the surrender of General Venancio, Aguinaldo's chief of staff. For a time after the close of active hostilities he was a military and later a civil governor in Ilocus. In 1911 he was commissary-general in the Philippines; in 1916 he was a lieutenant-colonel of field artillery; the next year he was made a brigadier-general, and 5 Aug 1917 he was raised to the rank of major-general. In 1918 he became Chief of Staff of the U. S. Army and in 1921 was retired.

MARCH, marh, Czechoslovakia, the principal river of Moravia, rising on the Silesian boundary, and flowing 214 miles southward to the Danube, which it joins six miles above Presburg. It is navigable for small boats from Goding, 50 miles from its mouth. In its lower course it forms the boundary between Austria and Hungary. Its chief affluent is the Thaya.

MARCH, in Europe, a frontier or boundary of a territory; especially applied to the boundaries or confines of political divisions; as, for example, the frontiers between England and Scotland, and England and Wales. Geneva is situated in the Marches of France, Savoy and Switzerland. See MARCHES, THE.

MARCH (Latin Martius), (1) the third month of the year, originally the first of the Roman year; so named in honor of the Roman deity Mars. Prior to 1752 the 25th of March was the first day of the legal year; hence, in all records, January, February and the first 24 days of March have frequently two years appended, as January 1, 170½ or 1701-2. (See CALENDAR). Until late in the 19th century, the custom of leasing dwellings from the 25th of March persisted in some localities. (2) A movement by regular steps in the manner of soldiers; also a journey performed by a body of soldiers either on foot or on horseback. Soldiers on a march are subject to certain rules very necessary to keep them in good order, and

fit to meet the enemy. The march in the first sense of regular step differs on different occasions. In the parade-march from 75 to 95 steps, each of about 30 inches, differing in different armies, are made in a minute; in the quickmarch from 108 to 115 steps; and in the double quick 150 running paces. This last cannot be sustained for any length of time, and is only used in a charge, or in storming a commanding position, and in a few internal movements of regiments (3) A musical composition, chiefly for military bands, with wind instruments, primarily intended to accompany the marching of troops. There are slow and quick marches, and marches peculiar to different countries. Marches are also introduced into oratomos, the best-known examples being the 'Dead March' from the oratorio of 'Saul' and Mendelssohn's 'Wedding March' See Music.

MARCH FLIES, small, hairy, scavenging flies of the family Bibionidæ, seen numerously in early spring, often before the snow has disappeared. The species are over 300, and some appear in vast swaims. The maggots hatch in refuse or manure upon the ground, and are believed to feed upon grass-roots.

MARCH TO THE SEA. There were two plans for a march to the sea by Sherman's aimy, the first General Grant's, the second General Sherman's, modifying the first. A campaign to the sea to divide the Confederacy was decided upon by General Grant in January 1864, when he was in command of the Military Division of the Mississippi, with headquarters at Nashville His objectives on the coast were first Mobile, second, Savannah, Atlanta being the intermediate objective for both. Sherman's aimy was then in the vicinity of Chattanooga, Tenn, and Ringgold, Ga.

In a letter to General Halleck, dated at Nashville, 15 Jan 1864, General Grant wrote: "I look upon the next line for me to secure, to be that from Chattanooga to Mobile, Montgomery and Atlanta being the important intermediate points." This he repeated on 19 January to General Thomas, then in command of the Army of the Cumberland at Chattanooga, and this officer immediately began to gather information, which General Grant desired, of the number of troops necessary to guard the roads and bridges from Nashville to Atlanta. These preparations were entrusted to General Thomas, as General Sherman was engaged with his Meridian campaign. In this connection, General Thomas expressed his confidence in being able with the Fourteenth and Fourth corps in advance, covered with a strong division of cavalry, and the Eleventh corps in reserve, to overcome all opposition as far as Atlanta.

When Grant was made lieutenant-general and ordered east to command all the armies, he called Sherman to Nashville, and they traveled together as far as Cincinnati. General Sherman was then made acquainted with the plans already set forth. As part of these plans, before leaving Nashville General Grant ordered Banks to concentrate at least 25,000 men to move against Mobile in the spring in co-operation with General Sherman.

In addition to letters to each of the commanders interested—Halleck, Sherman, Thomas and Banks—General Grant, 26 March 1864, sent all army commanders a map upon which was indicated by red lines the territory occupied by the Umon forces at the beginning of the war, and at the opening of the campaign of 1864. The territory which it was proposed to occupy by the campaigns about to begin was indicated by the blue lines. This map reached General Sherman 4 April, and its receipt was acknowledged by him. This map is reproduced in the Atlas of the 'Official Records' of the war, being plate 135 A of that publication. For Sherman's proposed campaign the blue lines extend from Chattanooga to Atlanta, and from this latter point both to Mobile and Savannah.

General Sherman, in acknowledging the map, said: "That map to me contains more information and ideas than a volume of printed matter. Keep your retained copies with infinite care, and if you have occasion to send out to other commanders any more I would advise a special courier. From that map I see all, and glad am I that there are minds now at Washington able to devise; and for my part, if we can keep our counsels, I believe I have the men and ability to march square up to the position

assigned me, and to hold it."

As the result of the campaign for Atlanta General Slocum occupied that city 2 September Meantime Farragut had taken possession of Mobile Bay 5 August. On 10 September Grant telegraphed Sherman from City Point as follows: "As soon as your men are properly rested, and preparations can be made, it is desirable that another campaign should be commenced. We want to keep the enemy continually pressed to the end of the war. If we give him no peace while the war lasts, the end can not be far distant Now that we have all of Mobile Bay that is valuable, I do not know, but it will be the best move for Major-General Canby's troops to act upon Savannah, while you move on Augusta. I should like to hear from you, however, on this matter."

To this Sherman telegraphed in reply: "If you can manage to take the Savannah River as high as Augusta, or the Chattahoochee as far up as Columbus, I can sweep the whole State of Georgia, otherwise I would risk our whole army by going too far from Atlanta"

In a letter from Atlanta, dated 20 September, Sherman gave Grant the conditions under which he could successfully co-operate in a movement on Savannah: "If you will secure Wilmington and the city of Savannah from your centre, and let General Canby have command over the Mississippi River and the country west of it, I will send a force to the Alabama and Appalachicola, provided you give me 100,000 of the drafted men to fill up my old regiments; and if you will fix a day to be in Savannah I will insure our possession of Macon and a point on the river below Augusta"

General Grant thereupon conferred by letter with General Halleck in regard to establishing a base on the coast for General Sherman and providing supplies, giving his own opinion that Savannah could be captured by troops from the East assisted by those in the Department of the South, and that the line of Augusta and Savannah would be a better one than Montgomery, Selma and Mobile. Grant further said in this letter 4 October: "Whichever way Sherman moves he will undoubtedly encounter Hood's army, and in crossing to the sea-coast

will sever the connection between Lee's army and his section of the country"

General Sherman fixes the day after his letter of 20 September as the date when his plan of a march to the sea came first into his mind. It differed from Grant's plan based upon first disposing of Hood's army, in that it involved leaving Hood in his rear, to be taken care of by Thomas, and marching through to Savannah with no enemy in his front. Upon this plan a discussion arose with Grant, who for some time held to the necessity of first dealing with Hood This discussion between Grant and Sherman lasted for several weeks. While it was in progress Hood became active. On 20 September Forrest's cavalry began vigorous operations about Athens and Decatur, Ala., and Pulaski, Tenn. Sherman at once sent troops to Chattanooga and 28 September General Thomas was ordered to proceed to Nashville to organize a force to meet a possible northward move of Hood. The first attempt of the latter was to break Sherman's communications by heavy movements upon his railroad. These met with only temporary success, as Sherman promptly pursued. The fighting at Allatoona 5 October was the most prominent affair. Hood then moved to the westward, and occupied Gadsden, Ala. Sherman again followed as far as Gaylesville. Sherman, 10 October, again proposed to Grant to leave Hood and march to the sea Grant replied the same day. "If you are satisfied the trip to the sea-coast can be made, holding the line of the Tennessee firmly, you may make it, destroying all the railroads south of Dalton or Chattanooga as you think best." This condition of firmly holding the line of the Tennessee held Sherman for a time. Although this conditional permission had been given by Grant, he telegraphed Sherman 1 November: "Do you not think it advisable, now that Hood has gone so far north, to entirely settle with him before starting on your proposed campaign? With Hood's army destroyed posed campaign? With Hood's army destroyed you can go where you please with impunity." Sherman learned, 26 October, that Hood's army had appeared about Decatur. This clearly indicated an invasion of Tennessee. General Sherman then decided to strengthen General Thomas, leave him to take care of Hood, withdraw his own army to Atlanta and prepare for a march to the sea provided General Grant's consent could finally be obtained. He sent the Fourth and the finally be obtained. He sent the Fourth and the Twenty-third corps back to Thomas. Thus the discussion with Grant over the question of first destroying Hood continued until 1 November, when, in response to a later telegram on that day from Sherman, which represented that Hood's whole force was only from 37,000 to 40,000, while Thomas would have from 63,000 to 70,000, and that he himself had retained only 50,000 men for his proposed campaign to the coast, General Grant telegraphed, "With the force, however, that you have left with General Thomas, he must be able to take care of Hood and destroy him. I really do not see that you can withdraw from where you are, without giving up all that we have gained in territory. I say then go on as you propose."

Having obtained this permission Sherman pushed his preparations with the greatest energy. The entire population of Atlanta had

already been deported; the various divisions of the army designed for the march were ordered to concentrate at Atlanta, all mills and factories at Rome were burned; the surplus stores, the sick, convalescent, and many thousands whose terms of service were about to expire were rushed to Chattanooga; the garrisons south of that place were withdrawn, and the railroad destroyed. Every command was carefully inspected, and soldiers found in any degree physically unsound were dispatched to Nashville Care was taken that every man's accoutrements were complete. In the same way the horses, mules and trains were inspected. Wilson's cavalry was dismounted to make Kilpatrick's division perfect, and the remnants sent with Wilson to Nashville.

The march to the sea began on the morning of 15 November. As General Sherman wrote: "It surely was a strange event - two armies marching in opposite directions, each in the full belief that it was achieving a final and con-clusive result in a great war;— Hood's army, which had required the active work of three armies from May until September to push it back to Atlanta, had crossed the Tennessee at Decatur, strengthened by Forrest's cavalry and aiming for Nashville and the Ohio River. The situation at Nashville was thus described by Sherman: "General Thomas was at Nashville, with Wilson's dismounted cavalry and a mass of new troops and quartermaster's employees amply sufficient to defend the place. Fourth and Twenty-third corps, under Generals Stanley and Schofield, were posted at Pulaski, Tennessee, and the cavalry of Hatch, Croxton and Capron, were about Florence, watching Hood. Smith's (A.J.) two divisions of the Sixteenth corps were still in Missouri, but were reported as ready to embark at Lexington for the Cumberland River and Nash-ville. Of course, General Thomas saw that on him would likely fall the real blow, and was naturally anxious.

Sherman started with 62,204 officers and men. Of his army he wrote: "The most extraordinary efforts had been made to purge this army of non-combatants and of sick men, for we knew well that there was to be no place of safety save with the army itself; our wagons were loaded with ammunition, provisions and forage, and we could ill afford to haul even sick men in the ambulances, so that all on this exhibit may be assumed to have been able-bodied, experienced soldiers, well armed, well equipped and provided, as far as human foresight could, with all the essentials of life, strength and vigorous action.»

The artillery, wagon and ambulance trains were perfect. Each gun, caisson and forge was drawn by eight horses. There were 2,500 wagons with six mules to each, and the ambulances each had two horses. Each soldier carried 40 rounds, and in the ammunition wagons were 200 rounds for men and artillery.

The right wing, Gen. O. O Howard, was composed of the Fifteenth and Seventeenth corps; the left wing, Gen. H. W Slocum, of the Fourteenth and the Twentieth.

The war had not produced a more thoroughly organized and equipped army, or one in which more men had passed a thorough physical inspection. As it started for the sea, General

Sherman in his 'Memoirs' thus describes the feelings of the men, and his own: "There was a devil-may-care feeling pervading officers and men, that made me feel the full load of responsibility, for success would be accepted as a matter of course, whereas, should we fail, this 'march' would be adjudged the wild adventure of a crazy fool." This question was to be decided at Nashville, as General Sherman wrote the day after he entered Savannah. "Thomas' complete success is necessary to vindicate my plans for this campaign—" The march to the sea cannot, therefore, be fully understood without considering the Nashville campaign as one of its essential parts. See Nasiville, Cam-PAIGN AND BATTLE OF

Sherman's army was composed of 55,329 infantry, 5,063 cavalry, and 1,812 artillery. There were two corps, 13 infantry divisions, one cavalry division, 36 brigades of infantry, two of cavalry and 16 batteries. There was no Confederate army between Atlanta and Savannah. Wheeler's cavalry was active on the flanks guarded by Kilpatrick's cavalry, and a considerable force of militia was encountered at Griswoldville.

The order for this historic march clearly presents its organization, its order of daily movement, its methods of living upon the country, the restrictions placed on its dealings with citizens, in short, the whole military machinery of the campaign It, therefore, deserves a place in every history of the March to the Sea, General Sherman himself holding that no account of that event could be perfect without it It was as follows:

(Special Field Orders, No 120).

(Special Field Orders, No 120).

Headquarters Military Division of the Mississippi In the Field, Kingston, Georgia, November 9, 1864

1 For the purpose of military operations, this army is divided into two wings, viz.

The right wing, Major-General O. O Howard commanding, composed of the Fifteenth and Seventeenth corps; the left wing, Major-General H W Slocum commanding, composed of the Fourteenth and Twentieth corps.

2. The habitual order of march will be, wherever practicable, by four roads, as nearly parallel as possible, and converging at points hereafter to be indicated in orders The cavalry, Brigadier-General Kilpatrick commanding, will receive special orders from the commander-in-chief

The cavalry, Brigadier-General Kilpatrick commanding, will receive special orders from the commander-in-chief

3. There will be no general train of supplies, but each corps will have its ammunition-train and provision-train, distributed habitually as follows. Behind each regiment should follow one wagon and one ambulance; behind each brigade should follow a due proportion of ammunition-wagons, provision-wagons, and ambulances. In case of danger, each corps commander should change this order of march, by having his advance and rear brigades unencumbered by wheels The separate columns will start habitually at 7.4. M, and make about fifteen miles per day, unless otherwise fixed in orders

A. M, and make about inteel times per day, times of wise fixed in orders

4. The army will forage liberally on the country during
the march. To this end, each brigade commander will
organize a good and sufficient foraging party, under the
command of one or more discrete officers, who will gather, near the route traveled, corn or forage of any kind, meat of near the route traveled, corn or forage of any kind, meat or any kind, vegetables, corn-meal, or whatever is needed by the command, aiming at all times to keep in the wagons at least ten days' provisions for his command, and three days' forage Soldiers must not enter the dwellings of the inhab-tants, or commit any trespass, but, during a halt or camp, they may be permitted to gather turnips, potatoes, and other vegetables, and to drive in stock in sight of their camp. To regular foraging-parties must be entrusted the gathering of provisions and forage, at any distance from the road traveled. 5. To corps commanders alone is entrusted the power to

provisions and forage, at any distance from the road traveled.

5. To corps commanders alone is entrusted the power to destroy mills, houses, cotton-gms, etc.; and for them this general principle is laid down! In districts and neighborhoods where the army is unmolested, no destruction of such property should be permitted; but should guerillas or bushwhackers molest our march, or should the inhabitants burn bridges, obstruct roads, or otherwise manifest local hostility, then army commanders should order and enforce a devastation more or less relentless, according to the measure of such hostility.

hostility.

6. As for horses, mules, wagons, etc., belonging to the inhabitants, the cavalry and artillery may appropriate freely and without limit, discriminating, however, between the rich, who are usually hostile, and the poor and industrious, usually neutral or friendly. Foraging parties may also take mules or horses, to replace the jaded animals of their trains, or to serve as pack-mules for the regiments or brigades. In all foraging of whatever kind, the parties engaged will refrain from abusive or threatening language, and may, where the effect in command thinks proper, give written certificates. officer in command thinks proper, give written certificates of the facts, but no receipts, and they will endeavor to leave with each family a reasonable portion for their maintenance 7 Negroes who are able-bodied and can be of service to

the several columns may be taken along, but each army commander will bear in mind that the question of supplies is a very important one, and that his first duty is to see to

those who bear arms

those who bear arms

3. The organization, at once, of a good pioneer battalion
for each army corps, composed if possible of negroes, should
be attended to This battalion should follow the advanceguard, repair roads and double them if possible, so that the
columns will not be delayed after reaching bad places. Also,
army commanders should practise the habit of giving the
artillery and wagons the road, marching their troops on one
side, and instruct their troops to assist wagons at steep hills
or bad crossings of streams

side, and instruct their troops to assist wagons at sleep inno or bad crossings of streams
9 Captain O. M. Poe, chief-engineer, will assign to each wing of the army a pontoon-train, fully equipped and organized, and the commanders thereof will see to their being properly protected at all times.

By order of Major-General W. T. Sherman,
L. M. Dayton, Aide-de-Camp

Leaving Atlanta in ruins, 15 November, the left wing, which General Sherman accompanied, marched by Decatur, Stone Mountain and Covington. At this point it turned toward Milledgeville, the capital of Georgia, which was the first objective. It was reached on the 22d. Meantime the right wing had marched by Jones-boro, McDonough and Monticello, and was in communication with Sherman at Gordon. Kilpatrick's cavalry, which was operating on the right of the advance, kept in contact with Wheeler's cavalry, and reached the defenses of Macon, thence retiring to Griswoldville, where Walcutt's brigade of Wood's division was halted as a rear-guard. Gen. G. W. Smith attacked Walcutt, but was repulsed (see Griswoldville, BATTLE OF). Governor Brown, the State officers and members of the legislature left the capital on Sherman's approach The arsenal

The march was resumed 24 November, with Millen as the next objective The two wings followed the general line of the railroad Millen was reached 3 December. From Millen the army proceeded by the four main roads for Savannah. The effort of the Confederate authornties to organize a force at Augusta to attack Sherman in flank failed, and the march to Savannah was only slightly disturbed by the persistent skirmishing of Wheeler's cavalry. McLaw's division of Hardee's force had advanced to Ogeechee Church, but fell back to the city upon Sherman's approach The several corps reached the defenses of Savannah 9 and 10 December, and occupied a line from the Ogeechee River on the right to the Savannah River on the left. Hardee occupied the city with something less than 10,000 men. Sherman's effective force numbered a little over 60,000. Hood held the Savannah River below Sherman's lines.

The march had cut a swath of many miles in width through the richest part of Georgia. The heads of the columns and the flanks swarmed with foraging parties, and a country which was daily scoured to supply food for a marching column of 60,000 soldiers was of necessity stripped of provisions, and of every-thing else that could contribute to the use or

comfort of an army Railroads had been destroyed for long distances, and all factories and other buildings burned which could contribute to army purposes. There had been no fighting worth mentioning, Griswoldville excepted, and that had only involved one Union brigade

General Sherman had left Atlanta with 62,-204 officers and men of all arms He reached Savannah with 60,057 On the march 103 were killed, 428 wounded, 278 missing and 1,338 captured Of those captured, a large proportion were foragers, better known in army vernacular as "bummers."

The night of 12 December a bridge had been completed over the Ogeechee, and the next morning Hazen's division crossed and marched at once to assault Fort McAllister (qv) and open the way to the sea An hour before sunset the assault was delivered and the fort taken

This success gave Sherman communication with the fleet which was awaiting him with

supplies, and mails for the army.

General Slocum, upon establishing his flank on the Savannah River, had captured two steamboats and sent a force to Hutchinson and Argyle islands just above the city, and sought permission to transfer a corps to the left bank of the river to close Hardee's only line of escape, General Slocum having already sent a brigade under Col E A Carman to the South Carolina shore General Sherman did not deem this prudent, and as a result Hardee later withdrew his entire force intact and without molestation

On 17 December General Sherman sent in a flag of truce demanding Hardee's surrender on the ground that he (Sherman) had received guns that could "cast heavy and destructive shot as far as the heart of the city"; that he controlled all avenues by which the city could be supplied with food; that he would grant liberal terms, but if forced to assault he should "feel justified in resorting to the harshest measures," and should make little effort to restrain his army.

General Hardee returned a defiant reply, saying he was not shut in, but had free and constant communication with his department. To the specific call for surrender he replied: "Your demand for the surrender of Savannah

and its dependent forts is refused.»

General Sherman then proceeded by boat to General Foster's headquarters at Hilton Head to request that a division be sent to occupy the road north of the Savannah River, which line of communication was still open to Hardee. On his return he received the news that during his absence Hardee had put down his bridges and withdrawn with his entire force. The next day General Sherman's forces occupied Savannah.

General Sherman's forces occupied Savannan.

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HV BONNTON

H. V. BOYNTON.

MARCHAND, mar-shan, Félix Gabriel, Canadian legislator and author: b Saint John's, province of Quebec, 9 Jan. 1832, d 1900 He was educated at Saint Hyacinth College, was admitted a notary public in 1855, entered practice at Saint John's, and from 1867 sat for the county of Saint John's in the legislative assembly of the province of Quebec. From 8 March 1878 to 19 March 1879 he was provincial secretary, from 19 March to 30 Oct 1879 was commissioner of Crown lands, and from 29 Jan 1887 to 1892 speaker of the assembly In 1897 he became Premier, with the Treasury portfolio. Subsequent to the invasion at Eccles Hill during the Fenian troubles (1870), he commanded a militia brigade He did much to improve Canadian journalism, and for many years was proprietor and editor of Le Franco-Canadien. He published a 'Manuel et Formulaire du Notariat'; and also the comedies 'Fatenville' and 'Erreur n'est pas Compte' in prose, and 'Un Bonheur en Attire un Autre' and 'Les Faux Brillants' in verse.

MARCHAND, Jean Baptiste, French officer: b. Thoissey, Ain, 1863; d. 14 Jan 1934. He entered the army in 1883 and after gaining a commission three years later won fame as an explorer, particularly in Africa He sought an improved route from the valley of the Niger to the Gulf of Guinea He became one of the most notable figures in the French public life because of his clash with Lord Kitchener in 1898. Marchand had established the post of Fashoda on the White Nile and had resisted several attacks of the dervishes, when General Kitchener appeared at the head of a British force and requested Mar-chand to withdraw. The latter refused and soon after departed for France to make his report but the French government receded from its position and the threatened clash between England and France was averted. Marchand was present at the relief of Peking in 1902 and resigned his commission in 1904, when his government refused him permission to enter the Russian army in the war with Japan. He was made Commander of the Legion of Honor, was again in the French army with rank of general in the Great War, was severely wounded in 1915 and was retired in 1919. Consult Murphy, 'Le commandant Marchand et ses compagnons d'armes à travers l'Afrique' (Paris 1900).

MARCHANT, mar'chant, James, English reformer: b. 18 Dec. 1867. He was educated in private and public schools and for some years was engaged as social writer and worker in East London and the provinces In 1889-94 he was evidential lecturer to the bishop of Saint Albans; in 1895-97 preacher-in-charge of the Trinity Presbyteriar Church, London; and in 1900-02 was civil minister of Saint Andrew's Church, Chatham. From 1903 to 1906 Mr. Marchant was secretary of Dr. Barnardo's Homes and Memorial. In 1905 he traveled on the Continent with Dr. Barnardo's successor investigating conditions of child-life and rescue work. In November 1911 he was dedicated to the work of the National Council of Public Morals in the private chapel of the dean of Westminster Abbey by the bishop of Durham and Rev. F. B. Meyer. His writings include 'Life of Dr. Paton' (1909); joint-author of 'The Memoirs of Dr. Bernardo' (1907); 'Letters

and Reminiscences of Dr. A Russel Wallace' (1916); 'History of the House of Cassell' (1917); 'The Master Problem' (1917); 'Coffins or Cradles' (1916); 'Birth-Rate and Empire' (1917); 'The Person of Christ'; 'Theories of the Resurrection' (1899); 'Anthology of Jesus' (1926); 'Deeds Done for Christ' (1928). He has also edited numerous publications.

MARCHES, The, Italy, a territory now included in the kingdom, but formerly constituting one of the legations of the Papal States It comprises the region lying between the Apennines and the Adriatic, and is divided into the modern four provinces—Urbino and Pesaro, Ancona, Macerata and Ascoli Piceno. See ITALY.

MARCHESI, mar-ka'sē, Mathilde, German singer: b Frankfort-on-Main, 26 March 1826; d 17 Nov. 1913 Her maiden name was Graumann; she studied under Nicolai in Vienna, and in Paris under Garcia, whose assistant she became. A splendid mezzo-soprano she toured Europe for several years, married, in 1852, the Marchese della Rajata Castrone, a political Italian refugee of 1848, also a singer, who had adopted the nom de théâtre of Salvatore Marchesi, and in 1854 became professor at the Vienna Conservatory She removed to Paris in 1861, where she published her "École de Chant." In 1865 she accepted a professorship in Cologne, but resigned in 1868 and returned to Vienna, staying at the Conservatoire 10 years. She settled in Paris again in 1881, and prepared many of the greatest singers of the younger generation, including Melba. Her later years were spent in London, where she conducted a singing academy with her daughter. She was a teacher of rare merit, and author of a method of singing, of two volumes of personal recollections in German (1877; 1888), and of 'Marchesi and Music' (1897). She received decorations and medals from the rulers of Italy, Great Britain, Germany and Austria.

MARCHIALI, mar-kē-a'lē, or MARCHI-ALY. See Iron Mask, Man with the

MARCHING THROUGH GEORGIA, a popular ballad sung during the American Civil War, and commemorating Sherman's March to the Sea. It was written by H. C Work (qv.) 16 Nov. 1864.

MARCIL, mär'sēl', Charles, Canadian statesman and journalist. b Sainte Scholastique, Quebec, I July 1860. He was educated in the common schools and at Ottawa University. In 1879 he became a member of the staff of the Montreal Gazette, and subsequently was successively member of the staffs of the Herald, the Post, La Patrie, and the Star, all of Montreal. In 1897 Mr. Marcil was an unsuccessful candidate for the Quebec legislative assembly for Gaspé County. In 1900 he was elected to the Dominion Parliament as Liberal member for Bonaventure; in 1905 he became deputy speaker and in 1909–11 was speaker of the House of Commons. Mr. Marcil became a member of the Privy Council for Canada in 1911. D. 30 Jan. 1937.

MARCION, mär'shi-on, founder of a Gnostic sect, called Marcionites: b. Sinope about the beginning of the 2d century, AD; d about 160. He became a wealthy shipowner, was very liberal, and went to Rome about 140 where he

gave generously to the Church but his views were so unusual that he was not warmly received. He attached himself while there to the Gnostic teacher Cerdo of Antioch, and founded a system antagonistic in many respects to Chrishanity Its principal feature was the irreconcilable opposition which it supposed to exist between the Creator and the Christian God, and between the religious systems, the law and the gospel, which it believed they respectively founded. The sect held the existence of three original principles - the supreme and invisible. whom Marcion called the Good; the visible God, the Creator; and the devil, or perhaps matter, the source of evil Marcion could not perceive in nature, or in the Old Testament, the same love which was in the gospel of Christ. He accordingly made the Creator, the God of the Old Testament, the author of suffering Jesus was not the Messiah promised by this being, but the son of the unseen God, who took the form but not the substance of man. Marcion denied the resurrection of the body: he condemned marriage, thinking it wrong to increase a race born in subjection to the harsh rule of the Creator He rejected the whole of the Old Testament, and of the New all except a few epistles and a mutilation of the Gospel of Luke. He led quite a following, which is traced for 500 years, and then disappeared. Consult Tertullian, 'Contra Marcionem'; Harnack, 'History of Dogma'

MARCO BOZZARIS. See Bozzaris, Marcos

MARCO POLO. See Polo, MARCO.

MARCOMANNI, mark-kō-man'ni ("men of the marches," "borderers"), ancient German tribe, belonging to the federation of the Suevi. About 10 BC, under their King Marbod or Maroboduus, they retired from their territory between the Elbe and the Oder before the advance of the Romans, settled in Bohemia, and there built up a powerful state, with which Tiberius made a treaty 6 A.D. Thirteen years later Maroboduus was defeated by Hermann, or Arminius, leader of the Cherusci, who also drove from power Catualda, Marbod's successor About the middle of the 2d century the Marcomanni, with other Teutonic tribes, attempted to make inroads into Pannonia; they were defeated by Marcus Aurelius in 178; Commodus made peace with them in 180; they furnished Roman troops and were heavily subsidized till the time of Aurelian, when in 270 they were again rebellious and again driven across the Danube In the 4th century the Marcomanni drop out of history.

MARCONI, Guglielmo, Italian inventor

MARCONI, Guglielmo, Italian inventor and electrical engineer: b. Marzabotto, Bologna, Italy, 25 April 1874; d. Rome, 20 July 1937. He was educated at Leghorn, under Prof. Rosa, and at Bologna University, and so early as 1890 undertook experiments in demonstration of his theory that the electric current readily passes through any substance, and when started in a given direction follows a direct course without the assistance of any sort of conductor. After various experiments in Italy, he finally invented an apparatus for wireless telegraphy, which was successfully tested in both Italy and England by Sir William Henry Preece, engineer and electrician-in-chief of the English postal-telegraph service. Marconi was the first

to perfect the appliances used in space telegraphy or radiography, and the first to patent the application of the electric waves discovered by Heinrich Hertz to the purposes of actual telegraphy as distinguished from mere signaling. This remains true in spite of all the discussion respecting the originality of Marconi's work. It was he who combined the important elements of the wireless telegraph that had previously been invented, and to him the scientific triumph of so-called "wireless" telegraphy is due. He came to the United States in 1899, there continued his experiments, and in 1900 employed his method in reporting the presidential election of that year. He had sent (27 March 1899) messages across the English Channel from the vicinity of Boulogne, France, to the South Foreland, England, 32 miles distant. In December 1901 he began his first experiments in transatlantic telegraphy without wires at Signal Hill, at the entrance to the harbor of Saint John's, N. F. He succeeded with these because of an exceedingly sensitive magnetic detector, that was affected by the very faint etheric vibrations. When his success became apparent through his receiving and plainly distinguishing signals from the Poldhu Station, England, the Anglo-American Cable Company, which holds a monopoly from Newfoundland, compelled him to withdraw, and he selected another station at Table Head, on the east of Glace Bay, Cape Breton Island On 25-26 Feb. 1902, Marconi, on his way to the United States on board the steamship Philadelphia, received signals at a distance of 2,099 miles and worded messages at a distance of 1,5515 miles. On 21 Dec. 1902 the first official transatlantic telegrams were sent from Table Head. Marcom later (18 Jan. 1903) sent from the South Wellfleet station, Cape Cod, Mass., direct to Poldhu (3,000 miles), a message from President Roosevelt to King Edward. In 1910 the Argentina station received messages of 5,600 miles transit, and since then South American stations have sent and received about 7,000 miles. The Italian government early introduced the Marconi system on its warships. and granted an annual subsidy of \$200,000 The English government also paid a royalty for the use of the system on its ships. On 18 Oct. 1907 the Marconi system between Nova Scotia and Ireland was formally opened for commercial

service. He continued his experiments and inventions, continually improving radiography and the methods employed. In 1906 his new persistent wave system was introduced, and devices developed for giving desired forms to the wave energy sent out. In 1910 his detector was radically improved, and he also brought into use a new receiver. A little later he developed a duplex by which messages could be sent and received at the same time by the same apparatus, without conflict, as is done in regular wire telegraphy. Mr. Marconi received numerous honors, in Italy, England, America and also in Continental Europe. He divided the Nobel prize for physics with Ferdinand Braun in 1909. He was decorated in Britain, Russia and Spain, and received the Grand Cross of the Crown of Italy. The great universities of the world showered degrees on him; Edison accepted official position in one of his companies; he was nominated a senator in the kingdom of Italy, and given the

freedom of war. During the First World War he had charge of Italy's wireless services, at this period developing short-wave transmission as a means of secret communication. After the war he fitted his yacht for experimental purposes, using it as a floating laboratory. The last years of his life were devoted to experiments with short waves and with microwaves, which he believed held the secret of television.

MARCOU, mar-koo', Jules, American geologist b. Salins, France, April 20, 1824; d. Cambridge, Mass, April 17, 1898. In 1848, having been appointed traveling geologist to the Jardin des Plantes, Paris, he went to the United States. He explored the Lake Superior country together with Louis Agassiz (qv), and made wide and important geological studies in Virginia, Pennsylvania and New Jersey. After several trips back to Europe, he settled in Cambridge, where he assisted Agassiz in the Museum of Comparative Zoology From 1853 to 1855 he was in the employ of the United States government, and from 1875 till shortly before his death he was again in the service Marcou made a section map of the 35th parallel from the Mississippi to the Pacific, and published Geological Map of the United States and British Provinces of North America (1853); A Catalogue of Geological Maps of America (1884); Geology of North America (1858); Life, Letters and Works of Louis Agassiz (1896).

MARCOUX, Joseph, Canadian missionary: b. Canada, about 1770; d 1855. Soon after his ordination as a Roman Catholic priest, his ecclesiastical superiors dispatched him as missionary to the Iroquois. In 1819 he settled among these Indians at Caughnawaga, on the Saint Lawrence, near Montreal. The school and church at Caughnawaga were monuments to the zeal of this modern apostle. Father Marcoux acquired a perfect mastery of the Iroquois tongue, of which he published a grammar and dictionary Other works by him in Iroquois were Life of Christ; Letters to Iroquois Chiefs (1848-49); Prayer Book (1852); Catechism (1854).

MARCUS, an island in the Pacific Ocean, north of the Tropic of Cancer, 700 miles northwest of Wake Island and about the same distance due east of the Volcano (Kazan) Islands. The Japanese took possession of it in 1899; subsequently they fortified the island, which had a garrison estimated to number 5,000 men when Japan entered the Second World War. A heavy raid on Marcus by United States naval vessels and carrier-based planes on Sept, 1, 1943, was the first of a series that continued through 1944, when it was attacked seven times from September to the end of the year. American assaults on the island were resumed in January 1945, and continued almost every month.

MARCUS AURELIUS ANTONINUS, mār'kūs â-rē'lĭ-ūs, often called simply Marcus Aurelius, Roman emperor: b. Rome April 29, 121 a.d.; d. Vindobona—the modern Vienna—March 17, 180 a.d. He was descended from an illustrious line which tradition declared extended to the good Numa, the second king of Rome. In the descendant Marcus were certainly to be found, with a great increment of many centuries

of noble life, all the virtues of his illustrious ancestor. Doubtless the cruel persecutions of the infamous emperors who preceded Hadrian account for the fact that the ancestors of Aurelius left the imperial city and found safety in Hispania Baetica, where, in a town called Succubo -not far from the present city of Cordova—the emperor's great-grandfather, Annius Verus, was born. From Spain also came the family of the Emperor Hadrian, who was an intimate friend of Annius Verus. The death of the father of Marcus Aurelius when the lad was of tender years led to his adoption by his grandfather and subsequently by Antoninus Pius By Antoninus he was subsequently named as joint heir to the imperial dignity with Commodus, the son of Aelius Caesar, who had previously been adopted by Hadrian. Among the many statues of Marcus extant is one representing him at the tender age of eight years offering sacrifice. He was even then a priest of Mars. It was the hand of Marcus alone that threw the crown so carefully and skilfully that it invariably alighted upon the head of the statue of the god. The great Emperor Antoninus Pius lived in the most simple and unostentatious manner, yet even this did not satisfy the exacting, lofty spirit of Marcus. At 12 years of age he began to practice all the austerities of Stoicism and became a veritable ascetic. He ate most sparingly; slept little, and when he did so it was upon a bed of boards. Only the repeated entreaties of his mother induced him to spread a few skins upon his couch. His health was seriously affected for a time; and it was, perhaps, to this extreme privation that his subsequent feebleness was largely due. His tutors, like Nero's, were the most distinguished teachers of the age; but unlike Nero, the lad was in every way worthy of his instruc-tors. His letters to his dearly beloved teacher, Fronto, are still extant, and in a very striking and charming way they illustrate the extreme simplicity of life in the imperial household in the villa of Antoninus Pius at Lorium by the sea In 140 he was made consul, and he held other offices before becoming emperor. He married Faustina, daughter of Antoninus Pius, about 145.

When his predecessor and adoptive father, Antoninus, felt the approach of death in 161, he gave to the tribune who asked him for the watchword for the night, the reply "Equanimity," directed that the golden statue of "Fortune" that always stood in the emperor's chamber should be transferred to that of Marcus Aurelius, and then turned his face and passed away as peacefully as if he had fallen asleep. The watchword of the father became the lifeword of the son, who pronounced upon that father, in the *Meditations*, one of the noblest eulogies ever written. Among the good works rendered to the empire during the 20 years of his reign were these: the establishment, upon eternal foundation, of the noble fabric of the civil lawthe prototype and basis of Justinian's task; the founding of schools for the education of poor children; the endowment of hospitals and homes for orphans of both sexes; the creation of trust companies to receive and distribute legacies and endowments; the just government of provinces; the complete reform of the system of collecting taxes; the abolition of the cruelty of the criminal laws and the mitigation of sentences unnecessarily severe; the regulation of gladiatorial exhibitions:

the diminution of the absolute power possessed by fathers over their children and of masters over their slaves; the admission of women to equal rights to succession to property from their children; the rigid suppression of spies and in-formers; and the adoption of the principle that merit, as distinguished from rank or politcal friendship, alone justified promotion in the public service. But the greatest reform was the reform in the imperial dignity itself, as examplified in the life and character of the emperor. It is this fact which gives to the 'Mediations' their distinctive value. The infinite charm, the tenderness and sweetness of their moial teachings, and their broad humanity, are chiefly noteworthy because the emperor himself practised in his daily life the principles of which he speaks, and because tenderness and sweetness, patience and prty, suffused his daily conduct and permeated his actions. The horrible cruelties of the reigns of Nero and Domitian seemed only awful dreams under the benignant rule of Marcus Aurelius It is not surprising that the deification of a deceased emperor, usually regarded by Senate and people as a hollow mockery, became a veritable fact upon the death of Marcus Aure-He was not regarded in any sense as mortal. All men said he had but returned to his heavenly place among the immortal gods. As his body passed, in the pomp of an imperial funeral, to its last resting-place, the tomb of Hadrian,—the modern Castle of Saint Angelo at Rome,- thousands invoked the divine blessing of Antoninus. His memory was sacredly cherished. His portrait was preserved as an inspiration in innumerable homes. His statue was almost universally given an honored place among the household gods. And all this continued during successive generations of men Marcus Aurelius has been censured for two acts: the first, the massacre of the Christians which took place during his reign; the second, the selection of his son, Commodus, as his successor. In extenuation of his persecution of the followers of Christianity, it has been alleged in his behalf that he was deceived by evil councillors, who misrepresented the conduct of the Christians to him. This excuse impinges upon his wisdom as a ruler and his admittedly wide knowledge of the conditions of the empire. It is further urged that when we take into consideration the environment of the emperor, no just cause for condemnation of his course remains He imbibed a bitter prejudice against the new religion from his beloved friend and instructor, Fronto. In the writings of Epictetus, whom he greatly revered, he found severe condemnation of the Christians as fanatics. With such a profound natural bias, it is urged, it is no wonder that he was led to regard the new creed with aversion. But the reason of his course is to be found rather in his deep-rooted attachment to the heathen beliefs of his ancestors and of the empire. It was rather his fear that the ancient cult, bound up as it seemed in the character of Roman rule, was seriously menaced by the progress of Christianity, which actuated him to the severe and bloody measures he took to root out a dangerous rival. He regarded Christianity as a "pernicious sect," a "secret conspiracy" against the empire, an "immoral superstition," whose poison was eating into the social life, and himself as the conservator of the empire and its traditions. Therefore some extenuation might

be conceded to such fierce zeal in persecuting the Christians in almost any other emperor than Marcus Aurelius But there is a glaring inconsistency in his character in the adoption of so cruel and monstrous a course by one who appears otherwise so admirable In this signal instance he is as bloody and heartless as a Domitian, a Nero or a Caligula; in all other things merciful, in this pitless; in his general administration, just and humane; in this, singularly unjust and even vindictive Whatsoever may be urged in his defense, this relentless persecution of the Christians is a dark blot on his fame. Whatever extenuating circumstances may seem to condone it, his policy in this instance was utterly inconsistent with his general character.

His first edict against the Christians was published in 177. Multitudes perished in the fierce persecutions which followed Notable amongst the victims were Saint Polycarp in Smyrna and Saint Cecilia at Rome. The manner in which they were tortured before being relieved from sufferings by death was more befitting a savage chief than a civilized ruler.

Of the appointment of Commodus as his successor, it may be said that the paternal heart hoped against hope for filial excellence. Marcus Aurelius believed, as clearly appears from many passages in the 'Meditations,' that men did not do evil willingly, but through ignorance; and that when the exceeding beauty of goodness had been fully disclosed to them, the depravity of evil conduct would appear no less clearly. The emperor who, when the head of his rebellious general was brought to him, grieved because that general had not lived to be forgiven; the ruler who burned unread all treasonable correspondence, would not, nay, could not believe in the existence of such an inhuman monster as Commodus proved himself to be. The appointment of Commodus was a calamity of the most terrific character; but it testifies in trumpet tones to the nobility of the emperor's heart, the sincerity of his own belief in the triumph of right and justice. Compare Farrar, 'Seekers after God' (1868); Renan, 'Marc Aurèle' (1881); Pater, 'Marius the Epicurean'; Arnold, M, 'Essays in Criticism' (First Series, New York 1883); 'Marcus Aurelius Antoninus to Himself' (English tr. by G. H. Randall, London 1910); 'The Communings with Himself of Marcus Aurelius Antoninus, Emperor of Rome, together with his Speeches and Sayings' (tr. C. R. Haines, London 1916); 'The Thoughts of the Emperor Marcus Aurelius Antoninus' (tr. George Long, illustr. W. Russell Flint, London 1909). Consult also Robinson, Ellis, 'Correspondence of Fronto and Marcus Aurelius' (Oxford 1904).

MARCUS GRÆCUS, græ'kus, alchemist, who lived not later than the 11th century, since he is cited by an Arabian physician of that date. In the National Library at Paris are two manuscript copies of a small treatise, entitled 'Liber Ignium' ad Comburendos Hostes, Auctore Marco Græco,' one of which appears to belong to the 14th and the other to the 15th century. The work contains an account of an explosive substance the ingredients of which are the same as those used in making gunpowder, though differently proportioned. It may have been that Schwartz, the reputed inventor of gunpowder,

did nothing more than experiment on the receipts of Marcus Græcus.

MARCUS HOOK, Pa, borough in Delaware County; alt 21 feet; on the Delaware River; 17m. SW. of Philadelphia; on the Pennsylvania and the Reading railroads It has oil refineries. Pop. (1930) 4,867; (1940) 4,123.

MARCY, Henry Orlando, American surgeon: b Otis, Mass, 23 June 1837; d 1 Jan 1924. He was educated at Amherst College. In 1863-64 he was assistant surgeon in the Union armies, and from 1865 to 1869 practised his profession at Cambridge, Mass In 1869-70 he studied abroad at Berlin, London and Edinburgh, was the first American pupil of Dr Lister, whose methods he introduced to America After his return to the United States Dr Marcy devoted his attention to laboratory and practical study of antiseptic methods of wound treatment After 1880 he conducted a private hospital in Cambridge for the treatment of surgical diseases Dr. Marcy published 'The Reproductive Process,' translation from G. B. Ercolane's work (2 vols., 1884); 'The Anatomy and Surgical Treatment of Hernia' (1889); 'The Perineum, Its Anatomy and Surgical Treatment' (1889), also many monographs on medical subjects.

MARCY, Randolph Barnes, American general: b. Greenwich, Mass, 9 April 1812; d Orange, 22 Nov. 1887. He was educated at West Point in 1832, and served in the Black Hawk War. During the Mexican War he was active at Palo Alto and Resaca de la Palma; and was made inspector-general, United States army, with the rank of colonel, in August 1861, serving as chief of staff to his son-in-law, Gen. George B. McClellan throughout the Civil War. He was appointed brigadier-general of volunteers, 23 Sept. 1861, was inspector-general, United States army, with rank of brigadier-general from December 1878. He was retired in the year last named. He published (Exploration of the Red River in 1852) (1853), 'The Prairie Traveler, a Handbook for Overland Emigrants' (1859); 'Thirty Years of Army Life on the Border' (1866); 'Border Remiscences' (1871).

MARCY, William Learned, American statesman: b. Southbridge, Mass, 12 Dec. 1786; d Ballston Spa, N. Y., 4 July 1857. He studied at Leicester Academy, in Massachusetts, and was graduated at Brown University in 1808. At Troy, N. Y., he studied law and was admitted to the bar. When the War of 1812 broke out he volunteered as a lieutenant, was sent at once into active service and 22 Oct. 1812 led an attack resulting in the capture of a Canadian post at Saint Regis. He was soon promoted to be captain, and served almost to the end of the war. Returning to Troy, he engaged in newspaper work and in politics, opposed Clinton and became prominent in the Albany Regency (q.v.). He had already held several offices when, in 1823, he was elected comptroller of the State. This position he filled six years, and in 1829 was appointed associate justice of the New York Supreme Court. The Democrats in 1831 elected him to the United States Senate, but the next year he was chosen governor of New York and resigned his senatorship. While in the Senate he was chairman of the Judiciary Com-

mittee, and in debate with Clay made a memorable defense of Martin Van Buren It was during a speech in the Senate vindicating the course of the President in giving offices to his political supporters that Marcy uttered the words associated with the beginning of the spoils system (qv): "We can see nothing wrong in the maxim that to the victors belong the spoils " Having served three terms as governor, he was once more nominated, in 1838, but was defeated by W H Seward (qv). In the following year Marcy was appointed by President Van Buren a commissioner on Mexican claims, serving till 1842. In 1845 he became Secretary of War under Polk, and in that office bore arduous responsibilities created by the Mexican War He also used his ofhical influence in the settlement of the momentous Oregon boundary question In 1848 he supported Cass as presidential candidate, and when Taylor was inaugurated Marcy retired to private life But during the administration of Pierce he served from 1853 to 1857 as Secretary of State, greatly distinguishing himself at home and abroad by his handling of grave matters - the Mexican boundary dispute, the reciprocity treaty with Canada, the British fishery question, the Koszta affair (see Ingraham, Duncan Nathaniel), On the inauguration of President Buchanan in 1857 Marcy finally retired from office, dying four months afterward Among states-men of administrative ability and thorough training, both for domestic and foreign affairs, he holds a high and permanent place. Consult Alexander, 'Political History of the State of New York' (1906).

MARCY, Mount, N. Y., the highest peak of the Adirondack Mountains, in the northeastern part of the State, in Essex County, about 28 miles west of Lake Champlain The altitude is 5,344 feet. Lake Tear of the Clouds, 4,327 feet above sea-level, usually considered the main source of the Hudson River, is just southwest of Mount Marcy. The Indian name for this peak was "Tahawas," meaning the "cloud-divider."

MARDEN, Orison Swett, American editor and author b. Thornton, N. H., about 1850; d. 10 March 1924. He was graduated at the Boston University in 1877; at the school of oratory there in 1879; at the law school of the same institution in 1881; and in 1882 at the Harvard Medical School He was founder and editor of Success and later of the New Success, and is the author of many works, among which are 'Pushing to the Front' (1894); 'How to Succeed' (1896); 'The Secret of Achievement' (1898); 'Character the Grandest Thing in the World' (1899); 'The Hour of Opportunity' (1900); 'Talks with Great Workers' (1901); and 'Stepping Stones' (1902); 'Every Man a King' (1906); 'The Optimistic Life' (1907); 'Why Grow Old' (1909); 'Getting On' (1910); 'Self Investment' (1911); 'The Joys of Living' (1913; The Crime of Silence' (1915); 'Everybody Ahead' (1917).

MARDI GRAS, mär'de gra, Shrove Tuesday, the last day before Lent. (See CARNIVAL). In the United States the day is observed in New Orleans and Memphis with processions masquerade balls and other gay entertainments.

MARDONIUS, mär-dō'nĭ-us, Persian general, was the son of the Satrap Gobryas, and

son-in-law of Darius Hystaspes. He commanded the first Persian armament sent against Greece, 492 BC, when a storm at Mount Athos destroyed his fleet, and his army was beaten in Macedonia He accompanied Xerxes in his invasion of Greece, of which he had been the chief promoter; and after the battle of Salamis, and the return of Xerxes to Asia, Mardonius was left in occupation at Athens, which he held for 10 months According to Herodotus he was defeated by Pausanias, and probably killed at the battle of Platæa, 479 BC

MARDUK. See Bel.

MARE CLAUSUM, ma'rē klâ'sŭm, a Latin phrase meaning closed sea, or that portion of the sea under the jurisdiction of a particular nation or government, as distinguished from the high sea. For many years it was held that a nation had no authority over waters more than three miles from its shores. But in the great World War these theories were east to the winds, and each side held what sea it could See INTERNATIONAL LAW

MARE ISLAND, Calif, at the mouth of the Napa River and the head of San Pablo Bay, in Solano County, opposite Vallejo. In 1854 Mare Island was established by the United States Government as a navy yard, with Capt (later Admiral) David G. Farragut in command With the Benicia Army Arsenal, only seven miles distant, Mare Island constitutes a vital factor in national preparedness. See Navy Yarn.

MAREE, Loch, löh ma-rē', Scotland, a lake in the west of Ross-shire, forming a long and comparatively narrow expanse, stretching southeast to northwest for 12½ miles with a breadth of from one-half to two miles. Its depth in most places is 60 fathoms; it has never been known to freeze The scenery along its shores is bold and picturesque, and its surface is studded with 32 wooded islands, on one of which are found the remains of an ancient chapel, with a graveyard. One is Saint Swithin's Isle, shaped like a doughnut, enclosing a lake 750 feet long The loch discharges itself into Lock Ewe by a small river of the same name

MAREIA, mä-rä'a, Lake. See Mareotis, Lake.

MAREMMA, mä-rěm'má, Italy, low swampy tracts extending along the west coast of Tuscany from the mouth of the Cecina to Orbitello; length, 92 miles; breadth, from 6 to 20 miles; area, about 1,000 square miles. Formerly these regions were fruitful, healthful and populous; but after the 15th century the neglect of the water-courses of the district allowed the formation of marshes and now they generate insects and fevers and present an aspect of dreary desolation during the summer months, when the inhabitants flee from the pestilences. In winter, on the other hand, the Maremma are inhabitable and afford a luxuriant pasturage for cattle, which graze in summer on the Apennines The district is gradually being reclaimed and improved.

MARENGO, Iowa, city and Iowa County seat; alt. 738 feet; on the Iowa River and on the Chicago, Rock Island and Pacific Railroad; 90m E. of Des Moines It is in a fertile agricultural and stock-raising locality; and

food-processing is its principal industry. It was settled in 1845, incorporated in 1859, and is governed by a mayor and council. The water system is city-owned Pop. (1930) 2,112; (1940) 2,260

MARENGO, ma-rěng'gō, Italy, a northern village, near the Bormida, three miles southeast of Alessandria. Its name is connected with the defeat of the Austrians by Napoleon 14 June 1800 The Austrians under Melas were at first successful, but French reinforcements arriving, the cavalry charge of the younger Kellermann turned what looked like certain defeat into a decisive victory. The forces engaged were 33,000 French and 30,500 Austrians; the French loss is variously stated as totaling in killed and wounded 4,000 to 7,000, the Austrians 9,000 to 10,000.

MAREOTIS, ma-rē-ō'tĭs, or MARIUT, ma-rē-oot', Egypt, a lake separated from the Mediterranean on the west by the long narrow belt on which Alexandria stands and communicating on the north with Lake Madieh. It is the most westerly of the lakes in the Nile Delta In the southwest it terminates in a long narrow creek; the main expanse is about 28 miles long by 20 broad. It was at one time deep enough for inland navigation, and had its shores covered with beautiful gardens and vine-yards, but having been cut off from the Nile, which supplied its water, it became dry and its area was cultivated. During the siege of Alexandria in 1801 the British let the sea into it, and it now yields much salt by evaporation.

MARE'S TAIL, a genus (Hippurus), of plants with whorled narrow leaves and small inconspicuous flowers set in their axils. They are aquatic or marsh plants. H. vulgarus is very common in Europe and in some parts of North America.

MARETZEK, mä'rè tsěk, Max, American musician: b Brunn, Austria, 28 Jan 1821; d Pleasant Plains, Staten Island, 14 May 1887. He was educated at the University of Vienna, but desirous of a wider field went to London and was connected for a time with its Italian Opera as chorus-master, writing in addition some music In 1848 he came to New York, where he was appointed leader of the orchestra at the Italian Opera and subsequently at the Astor Place Theatre and the Grand Opera House. He wrote the operas of 'Hamlet,' 'Sleepy Hollow,' and an interesting book on contemporary life entitled 'Crotchets and Quavers' (1858) Under his management many notable operas and artists, among the latter Adelina Patti and Pauline Lucca, were presented to American audiences.

MAREY, ma'rā, Etienne Jules, French physiologist b. Beaune, Côte-d'or, 1830; d. 1904. In 1850 he removed to the capital and took his degree in medicine there in 1860. In the same year he began his connection with the physiological department of the Collège de France; founded a physiological laboratory in 1864 and in 1867 became adjunct professor of physiology there. In 1872 he was elected member of the Academy of Medicine and of the Institute six years later. He made important investigations on the physiology of circulation and the heart, on the action of poisons, on animal heat, motion in animals, etc. He invented the

sphygmograph in 1863.

MARFA, Texas, city and Presidio County seat; on the Southern Pacific Railroad; alt. 4,688 feet; has municipal airport; ships cattle and mohair. Pop. (1940) 3,805.

MARFORIO, mär-fö'rĭ-ō, the popular name of a colossal statue representing the river Rhine, or Danube, or river god, standing in the court of a wing of the Capitol at Rome. The name Marforio is a corruption of Martis forum (the forum of Mars), in the entrance of which the statute originally stood.

MARGARET, Saint, queen of Scotland, elder sister of Edgar Aetheling, and grand-daughter of Edmund Ironside: b Hungary, about 1045; d. Edinburgh, 17 Nov. 1093. Shortly from William the Computation and Statistical Computations and Statistics and St after William the Conqueror had established himself on the English throne in 1066, she and her brother Edgar went to Scotland and placed themselves under the protection of Malcolm III Canmore, the Scottish king, who, c 1067, became her husband. She was characterized by great devotion to the Church, and it was largely through her influence with the king that the Scottish Church was brought into conformity with those of England and the Continent. She is said, moreover, to have elevated the manners of the Scottish court, and introduced great improvements in needle-work, embroidery and other similar arts. In her personal life, and the great care with which she educated her children, she set a noble example to the people of the somewhat rude and uncultured kingdom. In 1251 she was canonized Her daughter Matilda married the English king, Henry I, and thus the old Anglo-Saxon line became united with that of the usurping Normans. There is an ancient life of Saint Margaret, written in Latin, it is commonly believed by her confessor, Turgot, bishop of Saint Andrews. The Bodleian Library at Oxford contains a copy of the Gospels which once belonged to her.

MARGARET, queen of Denmark, Norway and Sweden, daughter of Waldemar IV, king of Denmark: b. Copenhagen, 1353; d. 29 Oct 1412. She was married to Haakon VI, king of Norway, in 1363, and the death of her husband in 1380 placed Norway in her hands; that of her son Olaf in 1387 enabled her to secure the throne of Denmark, to which she had previously brought about his election; and after defeating Albert of Mecklenburg, the Swedish king, she also obtained possession of the throne of Sweden. She endeavored to place the union of the three kingdoms on a permanent basis by the celebrated Act of Union, or Treaty of Kalmar (1397). She died after having raised herself to a degree of power then unequaled in Europe from the time of Charlemagne. She is sometimes styled "The Semiramis of the North."

MARGARET OF ANJOU, an'joo, or anzhoo, queen consort of Henry VI of England: b. probably at Pont-à-Mousson, Lorrame, 23 March 1430; d. near Saumur in Anjou, 25 April 1482. She was the daughter of René the Good, of Anjou, titular king of Naples, and was married to Henry in 1445. The imbecility of the king made her practically regent, and her power being contested by the Duke of York, a claimant of the throne by an older line, the protracted Wars of the Roses began. At first victorious, she was afterward compelled to flee

to Scotland, but raising an army in the north, she secured by the battles of Wakefield (1460) and Saint Albans (1461) the death of York, and the release of the king. Her army, however, was soon afterward annihilated at Towton (1461), and Edward (IV), the son of the late Duke of York, was declared king. She succeeded in obtaining assistance from Louis XI of France, but was once more defeated, and took refuge in that country. Warwick then became embroiled with the young king, and determined to replace Henry on the throne. Edward was in turn obliged to escape to the Continent, but obtaining assistance from the Duke of Burgundy returned and defeated Warwick at Barnet (1471). Margaret, collecting her partisans, fought the battle of Tewkesbury (1471), and was totally defeated She and her son were made prisoners, and the latter, when led into the presence of the royal victor, was killed Henry soon after died or was murdered in the Tower, and Margaret remained in prison four years Louis XI ransomed her for 50,000 crowns. See Henry VI; Roses, Wars of the

MARGARET OF AUSTRIA, regent of the Netherlands, and daughter of Maximilian I of Austria: b. Brussels, 10 Jan 1480; d Mechlin, 1 Dec. 1530 She was educated at the French court; was betrothed to the Dauphin Charles, who married Anne of Brittany; married John, the Spanish Crown-Prince, in 1497; and, after his death in the same year, married Philibert of Savoy in 1501, only to be widowed again in 1504. Three years afterward her father made her regent of the Netherlands, where she ruled with much ability although a bitter enemy of the Reformation She took a prominent part in the peace of Cambrai in 1529, which is called, because negotiated by her and Louise of Savoy, the "Paix des Dames."

MARGARET OF FLANDERS, Countess of Flanders and Hainault, sometimes called Margaret of Constantinople: b. Valenciennes about 1200; d. Lille, 1279 She was a daughter of Baldwin IX of Flanders and Hainault (Baldwin I of Constantinople), who was succeeded by Margaret's older sister, Jeanne. Margaret's husband, Bouchard d'Avesnes, was seized and killed by Jeanne, upon whose death Margaret came to the crown in 1244 Her reign was peaceable, save for the quarrels between her children by Bouchard and those by her second husband, William of Dampierre.

MARGARET or MARGUERITE OF NAVARRE, nå-var, queen of Navarre: b. Angoulême, 11 April 1492, d. Paris, 27 March 1549. (Variously known as Margaret of Angoulême, of Orléans, and of Valois) She was the daughter of Charles d'Orléans, Count of Angoulême (who was the son of John of Angoulême) and Louise of Savoy, and sister of Francis I of France. She was brought up at the court of Louis XII, married the Duke of Alençon in 1509, became a widow in 1525 and in 1527 married Henri d'Albret, titular king of Navarre. She never reigned over Navarre, but resided at the French court or kept a court of her own at Nérac and Pau. She was acquainted with the principles of the Protestant reformers, and not only afforded protection to reformed divines, but used her influence with her brother Francis to the same purpose, and was a great patroness of men of letters. In 1533 she published a re-

ligious poem, Le Miroir de l'Ame Pécheresse, which incurred the censure of the Sorbonne as heretical In 1547 a collection of her poems and other pieces was printed under the title of Marguerites de la Marguerite des Princesses The Heptaméron, ou sept Journées de la Reyne de Navarre, a famous collection of tales long attributed to her exclusively, is probably of composite authorship. She left one child, Jeanne d'Albret; afterward mother of Henry IV of France. See Heptameron, The.

MARGARET OF PARMA, regent of the Netherlands b. Oudenarde, 1522; d. Ortona, 1586 She was also known as Margaret of Austria. She was a natural daughter of Charles V of Spain by a Flemish woman Brought up in Brussels, she was married to Alessandro de Medici in 1536, and in 1538 to Ottavio Farnese, Duke of Parma, to whom she bore the great general, Alexander Farnese In 1559 Philip II made her regent of the Netherlands There she sided with Cardinal de Granvelle, introduced the Inquisition and provoked the provinces to revolt by her strong, masculine policy She resigned in 1567 when the Duke of Alva was sent to the Netherlands.

MARGARET OF VALOIS, và'lwà' or OF FRANCE, known as Queen Marcot b Saint Germain-en-Laye, France, 14 May 1553; d Paris, 27 March 1615 She was the daughter of Henry II of France and Catherine de Médicis. She married in 1572 Henry of Navarre, afterward Henry IV of France It was entirely a marriage of policy, and on Henry's accession to the throne their marriage was dissolved by mutual consent She resided thereafter in Paris where her house became the rendezvous of the learning and fashion of the time Some very agreeable poems by her are extant and her Memoirs (1842) are extremely interesting.

MARGARET SIDNEY. See LOTHROP, HARRIET MULFORD STONE.

MARGARET TUDOR, queen of Scotland, wife of James IV and daughter of Henry VII of England: b. Westminster, 29 Nov. 1489; d Methven Castle, 18 Oct. 1541. She was married to the king of Scotland when 14; bore him three children, of whom two, James, later fifth king of Scotland of that name and father of Mary Stuart, and Margaret, mother of Lord Darnley, survived her; and after the king's death (1514) married Douglas, Earl of Angus, from whom she was divorced in 1527, to marry soon after Henry Stewart, Lord of Methven. By descent from Margaret Tudor her greatgrandson, James VI of Scotland, was Elizabeth's successor as James I of England.

MARGARETTA, The, a British armed schooner, captured by Americans near Machias, Me., 12 June 1775, in the first naval contest of the Revolution. Benjamin Foster, Jeremiah O'Brien, and other men of Machias, resolved to prevent the sloops Unity and Polly carrying lumber from the port to the British at Boston, determined to seize the Margaretta, which had been sent to escort the vessels. Boarding the Unity and the Falmouth Packer, another schooner, they engaged the Margaretta outside the harbor, and captured the British ship after a short musketry fight, making the crew prison-

ers of war. The armament of the Margaretta was transferred to the Unity, which was thenceforth called the Machias Liberty.

MARGARIC ACID, name formerly given to an acid having the chemical formula $C_{17}H_{34}O_{2}$, and supposed to exist in natural fats. Later the name came to be applied only to an acid obtained by boiling cetylic cyanide with potassic hydrate solution. It resembles palmitic acid, forming white crystals which melt at 59.9° and boil at 277° under a pressure of 100 mm. The sodium salt, obtained by adding a boiling aqueous solution of pure sodic carbonate to a boiling alcoholic solution of margaric acid, forms a jelly-like mass.

MARGARINE, ma'ja-rin, a concentration of highly refined vegetable oils churned in fresh pasteurized skim milk. Some margarines are made with only edible meat fats; others are made from a blend of vegetable oils and edible meat fats. Margarines are churned to the con-

sistency of a spread for bread.

Invented by a French scientist, Hippolyte Mege-Mouries, the product now known as margarine won a contest sponsored by Napoleon III, who was searching for a palatable table fat to relieve a food shortage in 1870, during the Franco-Prussian War Introduced in the United States in 1874, during a period when a surplus of tarm products was being produced, margarine was almost immediately taxed by 22 states to prevent it from competing with dairy products In 1886 Congress applied the first federal taxes and restrictions to curtail margarine Amendments were passed in 1902, 1930, and 1931, increasing the severity of the original law. By 1944 federal taxes and license fees on margarine consisted of the following general provisions:

(1) A 10 cent per pound tax on yellow colored margarine and ¼ cent per pound on

uncolored margarine.

(2) An annual tax of \$600 for manufacturers, \$480 for wholesalers, and \$48 for retail dealers of margarine (If wholesalers or retail dealers sell only uncolored margarine, the annual tax is reduced to \$200 and \$6, respectively)

(3) Related restrictive provisions. For example: A restaurant or boarding house that now serves margarine and colors it is classed as a manufacturer and forced to pay the annual tax of \$600 in addition to the per pound

tax of 10 cents.

During the early part of the 20th century, methods of refining vegetable fats and oils, including coconut oil, were materially improved. Methods were discovered by which all odors and flavors could be removed from these fats, producing blandness which would then readily absorb all of the flavors of the milk to be incorporated. This led to the gradual increase in the use of this type of fat. The shortage of fats during and after the First World War, together with the highly increased production of coconut oil, led to this oil being predominantly used in margarine for a number of years, being supplanted by cottonseed oil in 1937. Since that time cottonseed and soybean oils have been most largely used in making this product. A large quantity of milk products are used and smaller amounts of corn oil, peanut oil, and oleo oils.

Margarine is now an important outlet for American farm products with ingredient materials supplied by 44 states. It is the decreasing use of oleo oils that has caused popular acceptance of the word «margarine» rather than «oleomargarine» Despite the fact that about 95 per cent of all margarine is made from vegetable and not oleo oils, the law still requires vegetable margarine packages to be labeled and legally

designated as «oleomargarine.»

The ingredients permitted or required to be used in the manufacture of margarine and the labeling requirements are specified in the «Definition and standard of Identity for Oleomargarine» adopted by the Food and Drug Administration of the Federal Security Agency in 1941. This permits the addition of 9,000 United States Pharmacopeia Units (U.S.P.) of vitamin A per pound. The definition and standard requires a specific minimum or maximum quantity of certain ingredients and informative labeling of margarine for the protection and information of consumers. This act has no relationship to the revenue laws which tax and restrict margarine.

Named as one of the "Basic Seven Foods" by the United States Department of Agriculture, margarine has been recognized by leading scientists and nutritionists. The Committee of Public Health Relations of the New York Acad-

emy of Medicine has said:

«From a nutritional viewpoint, when it is fortified with vitamin A in the required amount, margarine is the equal of butter, containing the same amounts of protein, fat, carbohydrates and calories per unit of weight. Moreover, since the minimum vitamin A content of enriched margarine is fixed, and the amount of this vitamin A in butter may range from 500 to 20,000 units per pound, enriched margarine is a more dependable source of vitamin A than is butter. Since it is a cheaper product than butter, fortified margarine constitutes a good vehicle for the distribution of vitamin A and fats to low-income groups and should therefore be made available to them.»

Similar statements have been made by the American Medical Association, the National Research Council, the American Dietetic Association, the American Hospital Association, the University of Southern California, and other

groups.

Efforts to repeal the margarine taxes have been supported by many groups, but have met with failure due to resistance by representatives of dairy states which contend that the revenue laws were enacted to protect consumers from fraud. This view overlooks the economic competition of margarine which is fundamental in any

consideration of margarine legislation

H.R. 2400, a measure to repeal the excise taxes and license fees on manufacturers, wholesalers, and retailers, was considered and defeated in the House Agricultural Committee in 1943. S. 1426, to suspend certain taxes on the manufacture and sale of colored margarine and to define a manufacturer of margarine, was considered, but also defeated in the Senate Finance Committee. S. 1744, a bill to regulate the production and distribution of margarine, in April 1944, was pending before the Senate Committee on Agriculture and Forestry. If enacted, this measure would repeal the license fees on wholesale and retail margarine dealers. Under S. 1744 all margarine, colored and uncolored, would

bear a ¼ cent per pound excise tax, and present manufacturer's license fee of \$600 per year would be retained None of these measures repeals any of the provisions of the Pure Food, Drug and Cosmetic Act or the «Definition and Standard of Identity for Oleomargarine.»

PAUL T. TRUITT,
President, National Association of Margarine
Manufacturers.

MARGARITA, mär-gå-rē'tä, Venezuela, an island off the northeast coast, in the Caribbean Sea, about 35 miles north of Cumana. In 1901 it was made a province and is known by the name of Nueva Esparta. Its area is 450 square miles. This island was discovered by Columbus in 1498, it was settled by the Spanish about 1525. The name Margarita, meaning "pearl," was given to it because of the pearl fisheries still existing in surrounding waters.

The surface is broken by two mountain chains, the highest point, peak of Macanao, being 4,484 feet. Near the centre is a lagoon, surrounded by low land. Much of the soil is fertile, but the chief industries are fishing, preparing salt for market and cattle-raising. The capital of the province is La Asunción; the chief port Pampatar. The inhabitants are nearly all Indians who have long been civilized. Pop.

73,375.

MARGARITE, or PEARL MICA, a native hydrous silicate of aluminum and calcium, having the formula $H_2\text{CaA}I_4\text{Si}_2\text{Oi}_{12}$, and usually occurring in laminated forms, like mica Its crystals, when they occur, belong to the monoclinic system Margarite is translucent or subtranslucent, with a vitreous or pearly lustre. It occurs in various colors, but predominantly in gray, with perhaps a pinkish tint. It has a hardness of from 35 to 45, and a specific gravity of about 3 Margarite usually occurs in connection with emery or corundum, from which it is obviously often derived.

MARGATE, mär'gāt, England, a seaport and popular summer watering resort of Londoners, in Kent, in the Isle of Thanet division, 64 miles by rail east of London. The restored parish church of Saint John the Baptist dates from 1050. It was originally a fishing village, but began to develop as a resort about the year 1800. Its sea-walks are continuous with those of Westgate and Broadstairs.

MARGATE FISH, a handsome, pearly white, brown-striped fish (Haemulon album) of West Indian waters, important as a food-fish, and ordinarily weighing about five pounds. It is caught about rocky reefs, in deep water, where it spawns in summer; and at night it comes in shore to obtain the small animals which swarm in the shallows. It is called jallao by Spanish-speaking fishermen, and market fish, and margaret grunt, by the English-speaking fishermen of Key West and the Bahamas.

MARGAY, mär'gā, a small, yellowish, profusely and beautifully spotted cat of the American tropical forests (*Felis tigrma*), also known in one of its varieties as "chati."

MARGHERITA, queen dowager of Italy: b. Turin, 20 Nov. 1851; d 4 Jan. 1926. She was the daughter of Ferdinand, Duke of Genoa. In 1868 she was married to Humbert, then crown prince of Italy, who ascended the throne of Italy in 1878. In that same year an attempt was made upon the life of the king, and the nervous shock to the queen seriously affected her health for a number of years. Her winning personality and dignified performance of her duty as queen gained her wide popularity in Italy. In 1900 her husband was assassinated and their son, Victor Emmanuel III. succeeded him as king

MARGHERITA PUSTERLA, for many years the most popular historical novel in Italy with the exception of Manzoni's masterpiece of promessi sposi, was written between 1833 and 1834 while the author, Cesare Cantu, lay in prison charged with political offenses against the Austrian authorities. Composed under great difficulties, suppressed by the foreign oppressors who felt themselves attacked through this work, the novel was not published till 1838. The theme deals with the period of the Italian despots of the 14th Century,—a perio which had already been treated in Tommaso Grossi's 'Marco Visconti' (1834), to which novel Cantù alludes in his own work. The scene is laid in Milan in 1340-41 during the reign of Luchino Visconti. The latter attempts to seduce Margherita, the wife of the rich and noble Francis-colo Pusterla. Rebuffed by her, the tyrant ceeks revenge by sending to the scaffold husband, wife and their young son, a mere child, after having had the parents condemned for treason against the state and conspiracy against his life. Vain attempts to save his master and his life. mistress by the devoted young squire, Alpinolo, an effort to deter the vindictive Luchino from his ciuel purpose on the part of the good monk Fra Buonvicino (a replica of the famous Fra Cristoforo of 'I promessi sposi'), heighten the interest of this sombre tale. With the exception of the impulsive and engaging Alpinolo, the saidonic court-jester Grillincervello and the saintly Fra Buonvicino, the characterization is mediocre. The book owes its success to the splendid pictures of mediæval life and to the pathos and horror of its situations. The execution of Margherita Pusterla, a powerful but revolting scene, has been much admired. For a historian of no mean ability, Cantù, as has been justly pointed out by Mazzoni, makes curious blunders and takes singular liberties with his sources. Written when Romanticism was supreme in Italy, 'Margherita Pusterla' is an imitation of 'I promessi sposi' combined with an attempt to rival the vast panoramas, the highly colored realism and the violent contrasts of 'Notre-Dame de Paris.' Consult De Sanctis, Francesco, 'La letteratura italiana del secolo XIX' (Naples 1902); and Mazzoni, Guido, 'L'Ottocento' (Milan 1913).

ALFRED G. PANARONI.

MARGOLIOUTH, mär-gō'li-oot, David
Samuel, English Arabic scholar: b. London,
17 Oct 1858; d. 23 Mar. 1940. He was educated
at Oxford, and was Laudian Professor of Arabic
at Oxford in 1889-1937. His published works
are associated chiefly with Arabic literature,
and include Letters of Abul Ala' (1898); 'Mohammed and the Rise of Islam' (1905); 'Yakut's
Dictionary of Learned Men' (edited in Arabic,
1907-25); 'The Homer of Aristotle' (1924).

MARGOLIS, Max Leopold, American Hebrew philologist: b Merech, Vilna, Russia, 15 Oct. 1866. In 1889 he was graduated at the Leibniz Gymnasium, Berlin, and in 1890 received the degree of A M at Columbia University and the degree of Ph.D the following year. In 1892 Dr. Margolis was lecturer on Jewish literature at the Glenmore School for Culture Sciences, Keene, N. Y. From 1892 to 1897 he was connected with the Hebrew Union College, Cincinnati, as assistant professor of Hebrew and Biblical exegesis. In 1897 he became professor of Semitic languages and literatures at the University of California, where he was associate professor from 1898 to 1905. In 1905-07 he held the chair of Biblical exegesis at Hebrew Union College. In 1907-08 Dr Margolis visited European libraries and in the following year was editor-in-chief of Bible translation for the Jewish Publication Society of America From 1909 he was professor of Biblical philology at the Dropsie College for Hebrew and Cognate Learning, Philadelphia He was the author of 'Commentarius Isaacidis quatenus ad textum talmudmentarius Isaacidis quatenus ad textum talmud-icum investigandum adhiberi possit tractatu Erubhin ostenditur' (1891); 'The Columbia College Manuscript of Meghilla' (1892); 'An Elementary Text-Book of Hebrew Accidence' (1893); 'The Theological Aspect of Reformed Judaism' (1904); 'The Holy Scriptures with Commentary on Micah' (1908); 'A Manual of the Aramaic Language of the Babylonian Tal-mud' (1910): 'The Story of Bible Translations' mud' (1910); 'The Story of Bible Translations' (1917); 'The Hebrew Scriptures in the Making' (1922); and contributions to philological and theological publications. In 1922 Dr. Margolis became editor of the Journal of the American Oriental Society. D. 2 April 1932.

MARGRAVE (German, Markgraf), in mediæval times, in continental Europe, a border count or commander entrusted with the protection of a mark, or district on the frontier. As early as the times of Charlemagne marks and margraves appear The margraves stood immediately under the German kings and emperors. In the 12th century margraviates became hereditary and at last the margraves acquired the rank of princes of the empire, between counts and dukes.

MARGRY, mar'grē', Pierre, French historian: b Paris, 1818; d. 1894. He received the appointment of adjunct curator of archives in the Ministry of Marine. He was, in 1842, appointed to study the history of the French in America. The result of his labors was included in several volumes, including 'La navigation du Mississippi et les précurseurs de Fulton aux Etats-Unis' (1859); 'Les Normands dans les vallées de l'Ohio et du Mississippi' (1860); 'Les navigateurs français et la révolution maritime du XIVème au XVIème siècle' (1867); 'Relations et mémoires pour servir à l'histoire de la France dans les pays d'outre mer' (1867); 'Les seigneurs de la Martinique' (1879); 'Découvertes et établissements des Français dans l'Amérique septentrionale' (1879-88); 'Le conquérant des îles Canaries' (1880) Margry also was editor of 'Les souvenirs d'un homme de lettres' (1877).

MARGUERITE, mär'gĕ-rēt, a popular name for several flowers of the family Asteraceæ. The blue marguerite (Felicia amelloides),

or blue daisy, is a native of southern Africa, and has long been popular in greenhouses and window gardens because of its simple culture and large solitary flower-heads. The Paris daisy or marguerite (Chrysanthemum frutescens), a native of the Canary Islands, was introduced into cultivation in Great Britain about the close of the 18th century and has continued a popular florist's flower ever since. It is the one usually obtainable throughout the year in the stores, but especially during the winter. Because of a close resemblance, the name is applied to its near relative, the ox-eye daisy (C. leucanthemum), which is common in mismanaged pastures and fields, especially in the New England and adjacent States. The Reine marguerite (Callistephus hortensis) is better known in America as China aster (see ASTER) and is one of the most popular out-of-door annuals of the garden, being easily grown from seed and readily adaptable to any garden soil. The English daisy (Bellis perennis) is also called marguerite, but less frequently. See Daisy.

MARIA CHRISTINA, ma-rē'ā krīs-tē'nā, queen of Spam: b. Naples, 27 April 1806; d. Havre, France, 22 Aug. 1878. She was a daughter of Francis I, king of the Two Sicilies, and was married to Ferdinand VII of Spain in 1829. Upon Ferdinand's death in 1833, Maria Christina by her husband's will became regent until her daughter, Queen Isabella, should become 18. A civil war which was waged until 1840 ensued, its purpose being to place Don Carlos on the throne, and its outcome was for a long period doubtful, but the queen-regent appeared to care only for her chamberlain, Don Fernando Muñoz, with whom she secretly contracted a morganatic marriage. Her policy as regent was entirely subject to the will of the minister of the day which naturally resulted in a reign alternately liberal and despotic. When she affixed her signature to the law concerning the Ayuntamientos the public protested so strongly that she was obliged to resign the regency to the Prime Minister, Espartero, in 1840. In 1843, after the fall of Espartero, she returned to Madrid and in 1844 publicly married Muñoz, who was made Duke of Rianzares. A revolution in 1854 compelled her to flee the country and her return to Spain in 1864 was followed by the revolution which dethroned Queen Isabella in 1868 and she was again exiled and though allowed to return to Madrid after the accession of Alfonso XII, she did in exile.

the accession of Alfonso XII, she did in exile.

MARIA CHRISTINA, queen of Spain:
b. Austria, 21 July 1858; d. Madrid, 6 Feb. 1929.
She was the daughter of Archduke Karl
Ferdinand of Austria, and was married by
proxy to Alfonso XII of Spain in 1879. At
the death of Alfonso XII in 1885, she was appointed queen-regent during the minority of her
daughter, Queen Mercedes, who was succeeded
six months later by Alfonso XIII, a posthumous
son. The queen-regent faced a difficult
problem; she was a foreigner, the people were
unsympathetic, and the political and financial
condition of the country was in a precarious
state. She formed a new cabinet with Sagasta,
the Liberal leader at its head, and soon won the
hearts of her people by her wise and able rule.
Throughout the time of her regency she commanded the respect and admiration of the world

as well as her own country for her clear, farsighted administration of the affairs of state and her careful training of the young king whom she endeavored to inspire with her own high sense of the responsibilities of his position. Even the disastrous outcome of the Spanish-American War failed to unsettle the stability of her government which on 17 May 1902 she surrendered into the hands of her son, Alfonso XIII.

MARIA II DA GLORIA, dä glö'rē-ā, queen of Portugal: b. Rio de Janeiro, 4 April 1819; d. Lisbon, 15 Nov. 1853. She was a daughter of Dom Pedro I of Brazil and on the death of her grandfather, John VI of Portugal in 1826, her father ceded to her the succession to the throne. Her uncle, Dom Miguel, to whom she was betrothed was appointed regent, but in 1828 upon the sailing of the young queen for Spain he usurped the throne and barred the landing of the queen. In 1832-33 Dom Pedro instigated a civil war against his brother and, through the intervention of England and France, Maria was placed on the throne in 1834 She married Duke Ferdinand of Saxe-Coburg and though retaining her throne had a troubled and rather unsuccessful reign. Upon her death her son, Pedro V, ascended the throne.

MARIA LESZCZYNSKA, les-chin'ska, queen of France: b Breslau, 23 June 1703; d Versailles, 24 June 1768 She was a daughter of Stanislas Leszczynska, king of Poland, and shared the obscurity which followed upon his exile. Her marriage to Louis XV in 1725 was arranged by the regent Duc de Bourbon and the minister Fleury and was regarded as an intrigue to further their interests since it antagonized Spain by sending back the young infanta with whom an alliance had been projected The queen after a brief period in which she tried to control state matters lived very quietly and was noted for her charities. Consult d'Armaille, 'La Reine Marie Leszczynska' (1870); Des Reaux, 'Le Roi Stanislas et Marie Leszczynska.'

MARIA LOUISA, loo-ē'zä, second wife of Napoleon I: b. 12 Dec. 1791; d. Vienna, 17 Dec. 1847. She was the eldest daughter of the Emperor Francis I of Austria and Maria Theresa, daughter of Ferdiand, king of Naples. Her marriage with Napoleon in 1810, after his divorce from Josephine, seemed to promise permanency to his dynasty and peace to the Continent, and her progress toward Paris through the different provinces of the kingdom was carried out like a triumph. In 1811 she bore him a son, to whom was given the title of king of Rome. In 1813, during Napoleon's absence at the war, he nanded her regent of the kingdom. After his overthrow she returned to Vienna, and remained there during the Hundred Days. In 1816 she received, with the title of Imperial Majesty, the duchies of Parma, Piacenza and Guastalla, and at a later period made a morganatic marriage with her chamberlain, Count Neipperg. Upon his dying in 1829, she took another chamberlain, Count Bombelles, and in 1833 secretly married him She governed her duchies generally with mildness, but the latter part of her reign was much disturbed by revolutionary outbreaks and the very violent means taken to repress them.

MARIA LOUISA, Order of. See Orders (Royal) and Decorations.

MARIA MAGDELENA, by C. F. Hebbel (Maria Magdelena,) which Hebbel called a "tragedy of common life," is more important as the forerunner of the peasant tragedies of Ibsen and Hauptmann than for any outstanding virtue of its own It lacks the grandeur, the large stage and large feeling, which give their special quality to 'Herod and Mariamne'; 'Judith' and 'Gyges and his Ring.' It exaggerates the asides and the soliloquies whose dramatic fitness Hebbel defended; it cannot pass the final test of tragedy, which is inevitability. And yet it is the work of a master-dramatist, and the history of realistic drama is not complete which does not include it. For it is one of the first dramas in which the tragedy is centred, not upon a situation but upon the character of a group; in which the conflict is not between the rights of the classes, but between individuals in a family for their personal rights as against "the cruelest of tyrants, the common-place man in the home circle" It has been called a "tragedy of the fallen woman," and, as such, its weaknesses are apparent. But it is not that. The name of the play is peculiarly unsuitable It is the tragedy of narrow vision, the tragedy of that fear of what people will say which actuates the life of Master Anton, of Clara, his daughter, and Carl his son, and of their friends and neighbors. 'Maria Magde-lena,' was one of the most popular of Hebbel's creations, and is still played in the repertory theaters

EDITH J R. ISAACS.

MARIA PIA, queen of Portugal: b. Turin, 1847, d Italy, 1911 Her father was Victor Emmanuel II of Italy At the age of 15 she was married to Luiz I, king of Portugal. She became dowager queen on 9 Oct 1889, when her son, Carlos I, ascended the Portuguese throne. The latter and his son, Crown Prince Luiz, were assassinated in Lisbon 1 Feb 1908, and the aged Maria Pia saw her grandson, Manuel II (qv), ascend the throne. Maria Pia devoted herself to charitable work and took no part in the public life of the nation. When the republic was proclaimed in 1910 she fled to Italy and sought refuge with her sister, Princess Clotilda.

MARIA THERESA, tē-rē'sa (Ger. tā-rā'za), German empress, queen of Hungary and Bohemia, Archduchess of Austria b. Vienna, 13 May 1717; d there, 29 Nov 1780 The oldest daughter of the Emperor Chailes VI, she was carefully educated, was named heir to the throne by the Pragmatic Sanction, and in 1736 married Stephen, Duke of Lorraine, who became Grand-Duke of Tuscany in the next year, and who in November 1740, a month after Maria's accession to the throne of Hungary, Austria and Bohemia, was named joint regent with her. France and Bavaria invaded Bohemia; and at the same time she was beset by Frederick the Great in Silesia, by Spain and Naples in Italy, and by the counterclaims of Charles Albert, who was proclaimed first Archduke of Austria and then German emperor She fled from Vienna to Presburg, convoked the Diet, raised a Hungarian army, won the alliance of England, made a secret peace with Prussia, surrendering Silesia and Glatz, and gained peace by the Treaty of Aix-la-Chapelle, October 1748,

securing the election of her husband as German emperor in return for the cession to Spain of Parma, Piacenza and Guasialla To revenge herself on Frederick she formed an alliance with Russia, and, by the help of her chancellor, Kaunitz, with France With the further help of Sweden and Saxony she was preparing to strike at Prussia, when Frederick forestalled her by striking the first blow and opening the Seven Years' War (qv). This terrible struggle availed Austria nothing and Maria Theresa had to admit Prussia's right to Silesia in the Peace of Hubertsburg 15 Feb 1763. Francis I, her husband, died 18 Aug. 1765, and Maria associated with her as emperor her oldest son, Joseph II, but kept in her own hands everything save military administration. Seven years afterward, upon the first partition of Poland, she received Galicia and Ludomeria; and in 1775 Bukovina was granted to Austria by Turkey. The Peace of Teschen, closing the War of the Bavarian Succession, brought Austria the Inn Valley in 1779; but the Princes' League (Furstenbund), under the lead of Frederick II, struck a heavy blow at Austrian supremacy. Though best known for her part in European politics, Maria Theresa was equally great in interior administration; Austrian finance was revived, agriculture encouraged and higher edu-cation fostered. The empress was a strict Catholic and an enemy of the Protestant Reformation, but in this latter part of her reign under the influence of her free-thinking son's policies, she was induced to enact some anti-ecclesiastical legislation, which he subsequently developed into persecutions. She was a pure and noble woman, strikingly beautiful in her youth. Ten of her 16 children survived her. Monuments to Maria Theresa are to be found in Klagenfurt, Vienna and Presburg. Her letters Angentut, Vienna and Fresburg. Her letters to her children and her friends were edited by Arneth (1881), who wrote 'Maria Theresa' (1888). Consult also de Broglie, 'Marie Thérèse' (1895); Wolf and Zwiedineck-Sudenhorst, 'Oesterreich unter Maria Theresa' (1884); Prieste (Marie Theresa) (1897) Bright, 'Maria Theresa' (1897).

MARIA THERESA, Order of. See ORDERS AND DECORATIONS

MARIAMNE, mā-rī-am'nē, granddaughter of Aristobulus and Hyrcanus, the high-priest, and wife of Herod the Great. Her history is related by Josephus from whom we learn that Herod was devotedly attached to her. She was condemned to death through the machinations of Salome, her husband's sister, on a false charge of adultery, 28 BC She met her fate with an intrepidity worthy of her noble ancestry, and was bitterly deplored by the king after her decease. Several plays have been based on the story.

MARIANA, Juan, hoo-ān' mā-rē-ā'na, Spanish historian: b Talavera, 1536; d. Madrid, 17 Feb. 1623. Taking holy orders he entered the Society of Jesus To his training at the University of Alcala he owes the pure taste and eloquence of his writings. He taught theology for 13 years with distinction in Rome, Sicily and Paris, returning to the Jesuits' College at Toledo in 1574, where he wrote his 'Historia de Rebus Hispaniæ' (1st ed, Toledo, 1592), in elegant Latin, but afterward translated it into Castilian. His tone is impartial, though he

loved Spain and admired Spanish virtue.

MARIANA, mā-rē-ā'na, in American colonial history, a name given by John Mason (qv.) to the tract granted to him between the Salem River and the Merrimac. Here he founded an agricultural settlement and formed the Laconia Company in 1629. Mason returned to England in 1633 and died there two years later. In 1691 his heirs sold all his lands and rights in New Hampshire to Gov. Samuel Allen.

MARIANAS ISLANDS, or LADRONES, a group in the Pacific Ocean, north of the Tropic of Cancer, 1,500 miles east of the Philippines; from north to south, the group extends for 380 miles. The islands were discovered in 1521 by Ferdinand Magellan (q.v.), who sighted Guam and Rota, and were settled by the Spaniards, who named them Islas de Ladrones ("Thieves Islands") because they were a renderwork for who named them Islas de Ladrones (Thieves Islands") because they were a rendezvous for pirates; after Jesuit missionaries were sent to the islands in 1667 by Mariana of Austria, queen of Spain, they were renamed Marianas for her. Spain ceded Guam (qv.) southernmost of the group, to the United States in 1898, following the Spanish-American War, and in 1899 sold the remaining islands to Germany for \$5,000,000; after the First World War the German islands together with the Marshalls and man islands, together with the Marshalls and the Carolines (qqv.), became a mandate of the League of Nations and were entrusted to Japan for administration.

The Japanese Marianas comprised 14 islands,

besides islets and reefs, with an aggregate area of 246 square miles, the population in 1935 numbered 44,025, including 39,728 Japanese. Northward from Guam, the islands are Rota, Tinian, ward from Guam, the Islands are Rota, Tinian, Saipan (on which is Garapan, pop. 6,000, the seat of administration), Farallon de Medinilla, Anatahan, Sarigan, Guguan, Zealandia Bank, Alamagan, Pagan, Agrihan, Asuncion, Maug, and Farallon de Pajaros. Saipan has 60 miles of railroad. The northernmost 10 islands are volcanic and uninhabited. Sugar and cotton are grown on Saipan (15 miles long by 4 in width), Timan (13 miles by 6), and Rota (12 miles by 4); and other crops, on all inhabited islands, tobacco, and coffee. The breadfruit tree was first discovered on the Marianas.

Early in 1944 United States naval and air forces commenced a series of attacks to retake

Guam and capture the Japanese Marianas. Troops were landed on Saipan on June 15, and on July 4 they occupied Garapan and Tanapag, on July 4 they occupied Garapan and Tanapag, a second town; the entire island fell to the Americans on July 9, the total cost being 3,426 killed and 13,099 wounded. The Japanese lost 27,586 killed and 2,161 captured, many of these being subsequently accounted for on hills and in caves to which they had retreated. The invasion of Tinian was launched on July 23, 1944, and the island was completely occupied by the end of the month, the United States suffering 1,829 casualties, of whom 314 represented men killed; 6,939 Japanese were killed, and 523 captured. Several other islands remained in Japanese hands; it was estimated in February 1945 that the garrisons of Rota, Pagan, and Agrihan

totaled 5,000 men.

MARIANNA, mâ-ri-ăn'a, Ark., town and Lee County seat, alt. 235 feet, on L'Anguille River; on the Missouri Pacific Railroad, 22m. NW. of Helena. It is in an agricultural region,

and cotton processing is the principal industri Pop (1930) 4,314; (1940) 4,449.

MARIANNA, Fla, city and Jackson Count scat, alt. 80 to 117 feet, on the Louisville an Nashville and the Marianna and Blountstow railroads It is the trading center for a regio producing corn, cotion, pecans, and fruit. Po (1940) 5,079.

MARIAZELL, mä-rē-ä-tsĕl', Austria, a pic turesque mountain village in Styria, near the Salza, 60 miles southwest of Vienna. It is noted pilgrim resort, annually visited by about 200,000 persons, attracted by the 12th centur image of the Virgin and Child.

MARICOPA, mä-rē-kō'pa, or COCC MARICOPA, an Arizona tribe of Indians, branch of the Yumans, formerly inhabiting the region around the confluence of the Gila ar Colorado rivers. Their descendants and the confluence of the confluence of the Gila ar Colorado rivers. Pimas, with whom they subsequently confede ated, are now to be found in the Gila Rivi Reservation to the number of about 400.

MARIE ANTOINETTE, mar'i ăn-toi-ne (Fr. ma-rē ān-twa-nēt), queen of France: Vienna, Austria, Nov. 2, 1755; d. Paris, Oct. 1 1793 She was the daughter of the Emper Francis I and Maria Theresa. In 1770 she wi married to the Duc de Berri, dauphin of Franc and after he ascended the throne in 1774: Louis XVI she made enemies about the cou because of youthful frivolities and extrav gances. Spoken of contemptuously as l'Autr cheme ("the Austrian woman"), she was co sidered to be too much under the influence her mother. Her name was further tarnished I the affair of the "Diamond Necklace" (q.v in which the Cardinal Louis de Rohan, the m gician Cagliostro, and the Countess de La Mot were the chief actors. Her unpopularity was i creased by the enthusiastic reception given h at a banquet on Oct 1, 1789, where the whi bourbon cockades were worn and the nation cockade trampled under foot. The attack Versailles and transfer of the royal family Paris shortly followed. The queen advised t flight of the royal family from Paris in Ju 1791, which ended in their capture at Varenna From that time they were viewed as traito On Aug. 10, 1792, the last day of the royal the queen exerted all her power to induce t king to resistance. This he thought was va and he was led with his consort before the Le islative Assembly. She heard his deposition a nounced, and then accompanied him to the pris nounced, and then accompanied him to the Inis of the Temple. There, deprived of every set blance of royalty, she displayed magnanim and patient endurance. In August 1793, she weremoved to the Conciergerie, and in Octob was brought before the revolutionary tribun She was charged with having dissipated the finances, exhausted the public treasury, companied with foreign enemies of France, a favored its domestic foes. She replied with fin favored its domestic foes. She replied with fire ness and decision, and heard her sentence pi nounced with perfect calmness. On the same d she was guillotined. Marie Antoinette's fau were due in great measure to her defective ed cation and difficult position. Her expiation them made her a general object of pityi

MARIE DE FRANCE, mä-rē de fra French poetess of the 12th century, a native Ile de France, whence her surname, who spe her life in England, where she was well known at the court of Henry II Her (Lais,) largely based on Breton stories, and full of Celtic spirit and pathos; fables, a revision under the title (Isopet) (that is, Æsop) of an English collection; and a tale, (Le Purgatoire de Saint Patrice,) make up the body of her work. The (Lais) are edited by Warnke (1900), and the (Purgatoire) by Jenkins (1894); each edition has a valuable preface.

MARIE GALANTE, gà-lànt, West Indies, an island, one of the Lesser Antilles, belonging to France, about 15 miles southeast from Guadeloupe. The area is about 60 square miles. The chief productions are sugar, coffee, tobacco, indigo and cotton. It is a dependency of Guadeloupe Columbus discovered it in 1493, and named it from his vessel, the Santa Marie The French occupied it in 1647, and lost it several times. In 1825 it suffered severely from the hurricane which desolated Guadeloupe (q.v.).

Pop 14,268, chiefly negroes.

MARIE DE MEDICIS, de mā-dē-ses, queen of France: b. Florence, 26 April 1573; d Cologne, 3 July 1642. She was the daughter of Francis I, Grand-Duke of Tuscany, and was married by proxy, 5 Oct. 1600, to Henry IV of France, with whom she constantly quarreled, partly because of his inconstancy and his open favor to the Marquise de Verneuil, and partly because of her own haughty, obstinate character, which was not unmixed with ambition. For years she urged him to have her crowned queen; the ceremony took place 13 May 1610, and on the next day the king was assassinated. Marie was accused of complicity in the plot, but the charge is not proven. For seven years she acted as regent and showed a strong friendship for Spain and the Catholic Church, being advised by the nuncio and the Spanish Ambassador as well as by such favorites as the Concinis. She quarreled with her son, later Louis XIII, was reconciled to him by Richelieu, and upon her attempt to displace the latter was forced by that great minister again to leave court in 1630. Her last years were spent in exile in Belgium, England and Cologne. The story of her poverty during these years is untrue. Consult Miss Pardoe, 'Life and Memoirs of Marie de Médici' (1852): Lord, 'The Regency of Marie de Médici' (1852): 10022 de Médicis (1903).

MARIE PAULINE, Princess Borghese. See Borghese, Marie Pauline.

MARIENBAD, ma-re'en-bad, Czechoslovakia, one of the most frequented and picturesque of the Bohemian watering-places, near the western frontier, in a triangular basin formed by several mountain ranges, about 32 miles northwest of Pilsen. The village, built on a slope, surrounded with woods of pine and fir trees, except in front, has a town-house with assembly-room and reading-rooms; several bathing establishments, theatre, etc. The springs utilized are eight in number and are cold; some are alkaline and containing Glauber's salts, others alkaline and chalybeate, etc. Seven are used externally and internally, one is used for bathing alone. Great quantities of the water are exported in times of peace. Pop. about 7,000.

MARIETTA, Ga., city, county seat of Cobb County, on the Nashville, Chattanooga & St. Louis, and Louisville & Nashville railroads, about 20 miles north by west of Atlanta. Kenesaw Mountain (qv) is west of the-city. It was settled about 1840-41 and incorporated in 1852. A city charter was granted in 1885. It is in a fertile agricultural region in which stock-raising is one of the prominent occupations. Large marble quarries are in the vicinity. The chief manufactures are chairs, dressed marble and machineshop products. The chief buildings are the churches and schools The Clarke Library, which contains about 5,500 volumes, is in Marietta A national cemetery located here contains the graves of 10,279 soldiers; the unknown dead number 2,967. The mayor and council are chosen at a popular election. Pop. (1920) 6,190; (1930) 7,638; (1940) 8,667.

Marietta was an intermediate objective point

in General Sherman's campaign for Atlanta, and when he crossed the Etowah 23 May 1864, his columns were headed for that place by way of Dallas and New Hope Church, but Gen. J E. Johnston threw his army in his front and checked him at New Hope Church and Dallas. After many hard-fought battles and constant severe skimishing, Johnston abandoned his Dallas lines (see Dallas, Ga., Battle Lines at) on 4 June, and took position covering Marietta, his left on Lost Mountain, his right beyond the railroad and behind Noonday Creek, with a strong advanced position on Pine Mountain. Sherman repaired the railroad, established a secondary, fortified base at Allatoona Pass, and joined by Blair's Seventeenth corps advanced 10 June and confronted Johnson in his new and strong position, and by the 14th was strongly intrenched before it in a continuous line of 10 miles Johnston abandoned Pine line of 10 miles Johnston abandoned Pine Mountain on the night of the 14th, and Sherman advanced his lines, bringing on the engagement at Pine Mountain (q v.) 15 June. The general movement was continued on the 16th and the right thrown forward to threaten the railroad below Marietta. On the 18th Johnston fell back to a new line, including Kenesaw Mountain, which was strongly fortified, and Sherman pressed in closely on the centre and left, north of Marietta, still con-tinuing the extension of his line to the right, south of it Johnston, making a corresponding movement by his left, encountered Sherman's right at Kolb's Farm (qv) on the 22d. Sherman assaulted Kenesaw Mountain (qv.) on the 27th, and was repulsed Flanking operations were then renewed to the right to reach the railroad, and Johnston, finding it in danger and his communications with Atlanta threatened. after being 26 days under an uninterrupted cannonade and infantry fire, abandoned Marietta on the night of 2 July and fell back to a new line, previously selected and intrenched, 10 miles south of Marietta, and covering the railroad and his pontoon-bridges across the Chattahoochee, with an advanced position at Smyrna Campground. Sherman occupied Marietta on the morning of 3 July The Union loss in the operations around Marietta was 1,790 killed and missing, and 5,740 wounded, an aggregate of 7,530. Johnston reported a Confederate loss of 468 killed and 3,480 wounded. Consult 'Official Records' (Vol. XXXVIII); Sherman, 'Memoirs' (Vol. II); Van Horne, 'History of the Army of the Cumberland' (Vol. II); Johnston, 'Narrative.'

MARIETTA, Ohio, city and Washington County seat, alt. 650 feet, on the Ohio River at the mouth of the Muskingum, on the Pennsylvania and the Baltimore and Ohio railroads, 95m in direct line SE. of Columbus, and on two federal and two state highways. It has river transportation, with service to many cities, and an airport. It lies in a region of fertile valleys, with coal, iron, oil, and natural gas deposits in the hilly parts. It handles large quantities of fruits and vegetables, shipped to various urban markets. The city's manufactures and industries include castings of iron, brass, aluminum, drilling tools, grindstones, metal signs and markers; paints and varnishes; gas engines and ranges; chemicals; household and office furniture; harness; and a varied list of miscellaneous trade articles Marietta has a National Guard armory; a Civil War monument, a monument to the pioneers, and a monument commemorating French participation in the settlement of America, a public library and a state museum, the Campus Martius; and two hospitals. It is the seat of Marietta College, chartered in 1835 but developed from an academy established in 1797. The city was settled in 1788. The Ohio Company of Associates, under the leadership of Manasseh Cutler (q v) and Gen Rufus Putnam, in Boston, bought lands in the southeastern part of the present State of Ohio, and Putnam led a party of settlers to Western Pennsylvania and thence down the rivers Upon landing at the mouth of the Muskingum, they called their community by that river's name, but soon changed it to Marietta, in honor of Marie Antoinette. The city developed as the westward country opened up; in its early years it was a thriving river town. The Marietta College museum contains some valuable relics of the early history of the western country, especially the records of the Ohio Company. The Mound Cemetery, which was set apart for public use in 1788, has the graves of a number of officers of the Revolution; it also contains an ancient Indian mound An interesting relic of the historic past is the old Northwest Territory land office, a small structure of hand-hewn timbers, in which the first official maps of the region were made and records of transactions in land were kept; it is one of the oldest buildings in the state At Blennerhassett Island, in the river, Aaron Burr visited his co-conspirator, Harman Blennerhassett, discussing plans for his "empire" in the Southwest. Marietta has mayor and council, with a service director (city manager) The water supply system is under municipal ownership. Pop. (1930) 14,285; (1940) 14,543 Consult King, 'History of Ohio'; Hoar, 'Oration at the Celebration of the Centennial of the Founding of the Northwest at Marietta'. Sum-Founding of the Northwest at Marietta'; Sum-

mers, Thomas J., 'History of Marietta'
MARIETTA COLLEGE, in Marietta,
Ohio, founded in 1835 for men and women. It
has college and preparatory departments, the
latter is known as Marietta Academy. The
courses lead to the degrees of AB, Ph.B and
BL. Courses are provided for work in music,
art and military science, and short summer
schools are given for work in the arts and
sciences. The library, which has about 100,000
volumes and 30,000 pamphlets, is noted for its
books on the history of the Northwest. There
are connected with the college 35 professors
and instructors and about 370 students. The

grounds and buildings and other property are valued at \$725,000, and the total income is about \$153,000

MARIETTE, ma'rē'et, Auguste Edouard French Egyptologist b Boulogne-sur-Mer, 11 Feb. 1821; d. Cairo, 19 Jan 1881. He was educated at the Boulogne Municipal College and in 1839 went to England as professor of French and drawing He returned to France in 1840, took his degree at Pouai in 1841 and became professor at his alma mater, the Boulogne Municipal College. While so engaged he became interested in archeology and in 1847 published (Lettres à M. Bouillet,) an essay on the history of Boulogne In 1848 he received a position in the Egyptian museum of the Louvre. and in 1850 was sent by the government to gather Coptic, Syriac, Arabic and Ethiopic manuscripts in Egypt. His excavations and discoveries in connection with his search for the true site of Memphis led to the finding of many important remains, such as the Serapeum, the first Memphian temple discovered, near the three great pyramids. Beginning to excavate four miles west of the accepted site of Memphis, Mariette came first upon an avenue of sphinxes, which led directly up to the magnificent granite and alabaster temple of Scrapis mentioned by Strabo, which contained the sarcophagi of the sacred bulls of Apis from the 19th dynasty to the Roman supremacy. Besides these he found no less than 2,000 sphinxes, and over 4,000 statues, bas-reliefs and inscriptions, some evidently of Greek construction; and various streets, colonnades, and other structures belong-ing to a great city. His excavations around the base of the sphinx near Gizeh not only disclosed the entrance to it, but proved it to be sculptured out of the solid rock In 1854 he returned to Paris and was made assistant conservator of the Louvre; and in 1855 was sent to Berlin to study Egyptian remains in the museums there On his return to Egypt, in 1858, the viceroy made him conservator of the monuments and antiquities of the land, with the title of hey, later promoted to pasha, with an annual appropriation for the prosecution of his researches, and the foundation and maintenance of the museum of Boulak His discoveries at Tanis revealed the monuments of the Hyksos dynasty, and those at Thebes explain the chronology of the various dynasties. In 1860 he made the important discovery of the mummy of Queen Aahhotep, of the 18th dynasty, with a wealth of jewels of exquisite workmanship belonging to her. In 1873 the Institute of France awarded him the biennial prize of 20,000 francs. His discoveries have been of utmost importance for the light that they have thrown upon the earliest periods of Egyptian history. His chief published works are 'Mémoire sur la mère d'Apis' (1856); 'Aperçu de l'Histoire d'Egypte' (1864); 'Nouvelle table d'Abydos' (1856), account of a second tablet found in Abydos which supplies the vacancies of the first and gives a list of the kings of the first six dynasties, corroborating that of Maneths; Le Sérapéum de Memphis that of Maneths; 'Le Sérapéum de Memphis' (1857-64); 'Fouilles exécutées en Egypte, en Nubia, et au Soudan d'apres les ordres du vice-roi d'Egypte' (1867); 'Notice des principaux monuments du musée de Boulak' (1870); 'Les Papyrus égyptiens du musée de Boulak' (1871); 'Album du musée de Boulak' (1873); 'Les Mastabas de l'Ancien Empire' (1881-89). Mariette lies buried in the museum-garden at Boulak, inclosed in an ancient Egyptian sarcophagus Consult Mariette, Edouard, (Mariette Pacha) (Paris 1904) and Maspero, G C C, (Notice biographique sur Auguste Mariette) (1b 1905).

MARIGNOLLI, ma'rēn-yōl'lē, Giovanni de', Italian traveler: b Florence, probably about 1290, date of death unknown, but subsequent to 1357 Entering the priesthood, he was appointed one of the four legates sent by Benedict XII to the great Khan of Cathay in 1338 The four legates accompanied by about 46 followers traveled east via Constantinople, whence in June 1339 they sailed across the Black Sea They spent the winter of 1339 at to Kaffa Sarai on the Volga, enjoying the hospitality of Mahommed Uzbeg, Khan of the Golden Horde From his court the party traversed the steppes to Almalig (Kulja), in the modern Ili They reached Peking via Kamul about June 1342, and were well received by the Khan. The arrival of this embassy is chronicled in Chinese annals Marignolli remained three or four years in Peking, after which he wandered through eastern China to Amoy Harbor In 1348 he reached Kaulam (Columbum) in Malabar, where he founded a Latin church. He stayed 18 months there after which he appears to have visited the coast near Madras, thence journeyed to Java, and on a voyage to Europe was wrecked at Bernwala (Pervily), Ceylon, where he was de-tained four months by the native ruler, Khoja Jahan. Marignolli returned via Armuz, Bagdad, Mosul, Aleppo, Damascus and Jerusalem, arriving at Avignon in 1353 and delivering a letter from the Khan to Pope Innocent VI. In 1354 the emperor, Charles IV, made Marignolli one of his chaplains, and soon afterward he was consecrated bishop of Bisignano. It does not appear, however, that he ever took possession of his see. About 1355 he removed in the retinue of the emperor to Prague and was papal envoy to Florence in 1356 In 1357 he was at Bologna. The last trace of Marignolli is a letter to him from Richard Fitz Ralph, archbishop of Armagh, Ireland, in which the writer objects to the sending of Marignolli as papal envoy to Ireland. In 1768 Marignolli's work appeared in volume II of 'Monumenta historiæ Bohemiæ, edited by Dobner Modern readers were first attracted by the account published by J G Meinert (1820). Consult Beazley, C R., 'Dawn of Modern Geography' (Vol III, 142, 180–181, 184–185, 215, 231, 288–309, 1906).

MARIGOLD, a popular name for several unrelated plants. The pot marigold (Calendula officinalis) is one of the most widely popular of garden plants It is grown for its brilliant flowers which range from white to rich orange, and for its flower-heads, which are often used to flavor soups, stews and dressings The African marigold (Tagetes erecta) and the French marigold (T patula) are also widely used for ornament Their flowers are usually some shade of yellow, but some are brown and some striped The Cape marigold (Dimorphortheca spp.) is also grown for ornament but is less popular than the above. The corn-marigold (Chrysanthemum segetum) is a weed especially common in Europe grain-fields, but also cultivated for its flowers, for which the plant is sometimes forced in greenhouses. All these belong to the

family Asteraceæ The marsh marigold (Caltha palustris) is a member of the family Ranunculaceæ It is a well-known plant in the marshes and wet meadows of North America The leaves, gathered before flowering, are widely used as a potherb under the name of "cowslip greens" The name fig marigold is applied to various members of the genus Mesembryanthemum, several of which are cultivated for their grotesque forms, their peculiar foliage, etc.

MARIKINA, măr-ĭ-kē'na, a Brazılıan name for a marmoset (q v)

MARINDUQUE, ma-rēn-doo'kā, Philippines, an island lying southwest of the province of Tayabas, Luzon, and 30 miles southeast of Lipa, it is circular in shape, being 24 miles north and south and 23 miles east and west. area, 667 square miles A mountain range runs from north to south across the island, and near its centre are short spurs running east and The staple products are rice, cocoanuts and hemp; the island is heavily wooded, and fruits are abundant and an important article of food among the natives. The chief industry is the raising of rice, of which large quantities are exported; the hemp of Marinduque is of a peculiar fine quality, and is used for weaving. At the southern end of the island there is excellent pasturage, and horses and cattle are raised. It is in the route of steamers in the local trade between Manila and the Visayan Islands and Mindanao, and its two chief towns are ports of call for these steamers. In the winter of 1898-99 Marinduque was occupied by the United States troops, it being the first important position in the south taken after leaving Verde Passage In 1901, with the small islands adjacent, it was created a province under civil government; 23 June 1902 the pro-visions of the Provincial Government Act were extended to the island of Mindoro and the Lubang group by incorporating them with the province of Marinduque. Pop about 52,000, mostly Tagálogs.

MARINE ANIMAL OILS. See OIL.

MARINE CITY, Mich, city in Saint Clair County, situated on the Saint Clair River and the Port Huron and Detroit Railroad, 45 miles north of Detroit It enjoys considerable reputation as a summer resort, but is also a busy manufacturing centre with salt works, beet sugar factories, ship yards and lesser manufactories. Pop. (1940) 2,633.

MARINE CORPS, United States. An independent branch of the military forces of the United States, which dates its existence from 10 Nov. 1775, when, following the establishment of the navy, the Continental Congress authorized the formation of two battalions of marines. It operates under the direction of the Secretary of the Navy, and detachments of the corps serve on the larger vessels of the United States Navy, at the various naval stations, and in various foreign countries Since the corps was created it has participated in all wars of the United States, and at various times detachments have been in action in China, Nicaragua, Haiti, and Mexico, and many other foreign lands, where they have been sent to protect American lives or American interests. The world-wide service of the corps is symbolized in its insignia represented

by the globe, foul anchor, and surmounting eagle holding in its bill a streamer upon which is inscribed the motto of the organization: «Semper

Fidelis x

Despite the fact that the marine corps regards 10 Nov. 1775 as its birthday, the history of the American marines antedates that of the United States as an independent country. As early as 1740 three marine regiments were recruited in America, assembled in New York under the command of General Alexander Spotswood of Virginia, and performed valiant service in the West Indies for the Royal British Navy. Included among the officers of these marines was Lawrence Washington, a brother of General George Washington. During the colonial period, which ended in 1775, thousands of men acting as marines, and known as such, served on American vessels, and took part in many expeditions, including those against Acadia, Louisburg, Quebec, Cartegena, and Porto Bello. During the Revolu-tionary War the navies of several of the colonies came into existence, and many of their vessels carried marines who played an important part in the operations against the enemy. In May 1775 marines served with Benedict Arnold at Lake Champlain, and a few months later, on board Washington's cruisers in New England waters.

In 1776 a detachment of marines took part in the expedition of Commodore Esek Hopkins against New Providence, in the Bahamas, where occurred the first fight in the history of the regular navy. In this engagement the attacking party of some 300 marines and sailors under Major Samuel Nicholas—first commandant of the marines-captured the enemy forts and a quantity of military stores, including a large amount of powder which was badly needed by the colonial forces. One battalion of marines, sent as reinforcement to Washington after the retreat across New Jersey, fought with him at the Battle of Princeton, and in subsequent land engagements. Other marines, serving on board all the larger vessels of the navy, took part in various sea fights that helped to bring success to American arms. Under John Paul Jones, they participated in the famous battle between the Ranger and the Drake, and in the great victory of the Bon Homme Richard over the British Serapis, which has been termed «one of the most remarkable and desperate fights in the annals of our navy.»

Following the close of the war, the marines, like the army and the navy, were disbanded with nothing remaining but a glorious record. However, when the threatening attitude of various foreign countries called for the creation of defense forces, a regular Navy Department was set up and on 11 July 1798 President John Adams approved an act of the Congress providing for the establishment of a marine corps, patterned somewhat after the Royal Marines of Great Britain. The naval war with France (1799–1801) afforded the newly created marines their first opportunity for action, and in the various sea fights they gave a good account of themselves. During the war with the Barbary States, marines serving with the navy not only took part in the bombardment of Tripoli, but served under Commodore Stephen Decatur in all of his daring exploits, including the burning of the *Philadelphia* in the face of enemy fire. In April 1805 a detachment of marines under

Lieutenant P. N. O'Bannon, U.S.M.C., marched 600 miles across the North African desert, and took part in the capture of Derne After lowering the Tripolitan flag, they hoisted in its place the Stars and Stripes—the first time the American flag ever flew over an Old World fort. «To the Shores of Tripoli» has ever since been inscribed on the banners of the corps, and is recorded in the Marines' Hymn. (See Barbary Powers, Philadelphia, Destruction of The)

The marines also took an active part in the War of 1812 on both land and sea. They participated in all of the many sea fights and were aboard the Constitution in her memorable fight with and defeat of the Guerriere, when their commander, Lieutenant Bush, was killed repelling boarders; they took part in the sangunary combat between the Chesapeake and the Shannon when Lieutenant Brown and 11 of his men were killed; under Commodore Decatur, they fought with great steadiness in the battle that resulted in the capture of the frigate Madedonian by the United States; they shared in the decisive victory on Lake Erie; and won additional honors as part of the military force under General Dearborn which invaded Canada. They also fought in the Battle of Bladensburg under Commodore Barney, and with General Andrew Jackson in the Battle of New Orleans. In succeeding years the marines saw action in many parts of the world. They served against Indians in Georgia and Florida, against pirates in the West Indies, and on punitive expeditions against the South Sea islanders of Quallah Battoo, Sumatra, and the Fijis.

During the War with Mexico, marines served under Commodores Sloat, Shubrick and Stockton; on the Pacific Coast; under Commodores Connor and Perry on the East Coast, and on shore under Generals Scott, Taylor and Worth. They were present at the capture of Monterey, Yerba Buena (San Francisco), and Mazatlan, and were highly commended by Commodore Shubrick for their conduct at Los Angeles, San Diego, San Gabriel and Guaymas. They took part in the capture of Vera Cruz; marched with General Scott on Mexico City; aided in the storming and capture of Chapultepec; then entered the Grand Plaza, in Mexico City, and led the way to the Hall of the Montezumas. Hence the inscription "From the Hall of the Montezumas to the Shores of Tripoli," which appears on the banners of the corps Detachments of marines formed part of Commodore Perry's expedition to Japan which opened the doors of the Mikado's realm in 1853–54 to

civilization and commerce

During the Civil War marines took part in all of the more important naval engagements, including those of the Gulf and the lower Mississippi, and the Battle of Mobile Bay, also in many of the battles on land. They fought in the first Battle of Bull Run, participated in the night attack on Fort Sumter in 1863, in the operations leading to the capture of New Orleans, in the fight between the Alabama and the Kearsarge, and in the attack on Fort Fisher, the last big operation of the war. In 1859 marines constituted a part of the force under Colonel Robert E. Lee, then an officer in the United States Army, that captured John Brown, and suppressed the riot at Harpers Ferry. After the close of the Civil War the marines devoted a large part of their time to aiding the civil

authorities in suppressing labor riots in Baltimore and Philadelphia, and in helping to enforce the revenue laws in New York. In the meantime, they took part in expeditions to the Caribbean area, and to Korea, China and other far away places for the purpose of protecting American lives and property. During the years 1867 and 1870 they formed a part of the Formosa expedition, and in 1871 they led the advance against the Korean forts in reprisal for serious offenses against Americans. In 1882, 77 years after O'Bannon hoisted the American flag over the fort at Deine, North Africa, a detachment of marines was landed at Alexandria, Egypt, to prevent pillaging and to aid in restoring order. Following the outbreak of the Spanish-American War in 1898 a detachment of marines occupied Guantanamo, Cuba, and aided by ships of the navy, defended that place against 6,000 Spaniards. as a result of which Guantanamo became and is now an important naval base of the United States. Marines also took part in the Battle of Manila Bay under Commodore Dewey and in the naval battle off Santiago, Cuba.

When the Boxer Rebellion broke out in China in the summer of 1900, marines landed from ships on the Asiatic station, took part in the defense of the legation quarter at Peking (Peiping). A regiment of marmes formed part of the Allied relief expedition from Taku to Peking and also participated in the Battle of Tientsin. Later combined forces of the army and marine corps took part in suppressing an insurrection in the Philippines, and participated in the Battle of Novaleta and in the expedition across the Island of Samar. In 1903 detachments of marines were landed in Santo Domingo and Korea, while a force was sent to Abyssinia by camel caravan across the desert to negotiate a treaty with King Menelik. Since the turn of the century, with the possible exception of 1913, not a year has passed in which the marines have not taken part in some expedi-honary service. In 1903 and 1904 they served on the Isthmus during the formation of the Republic of Panama. Sixty years earlier they had helped to make transit of the Isthmus a safe undertaking. In 1006 form house. naa neiped to make transit of the Islimus a safe undertaking. In 1906 four battalions of marines were sent to Cuba where, in conjunction with the army, they became the "Army of Cuban Pacification." In 1908, 1909, and 1910 marines were again sent to Pananna, and in 1909 a detachment was sent to Nicaragua, where they have been more or less at home since their they have been more or less at home since their first landing there in 1852. As early as 1854 a force of marines was landed in China to protect the lives of foreigners, including Americans, and many times since they have performed similar duties in that country. In fact, since about 1905 the marine corps has maintained a strong guard for the American Legation and stong guard for the American Legation and Embassy in Peking (Peiping). In 1911 and 1912 marines were sent there to protect Americans during the overthrow of the Manchu Dynasty. Several times during 1924 marines and sailors were landed in China to protect American nationals and in 1927 a force of American nationals and in 1927 a force of about 5.000 marines were discatched and statements. about 5,000 marines was dispatched and stationed at various trouble areas in China, principally in Shanghai and Tientsin. Most of this force, with the exception of the two-battalion regiment (Fourth Marines), returned to the United States in 1929. The force left behind, with occasional reinforcements, has devoted most

of its attention to protecting the International Settlement against invasion by belligerents. In 1937 the marine force in Shanghai was increased to a strength of nearly 3,000 men. The Sixth Marines were withdrawn after a few months but the Fourth Marines were left behind to aid other foreign forces in protecting the Interna-tional Settlement. In 1938 a marine detachment was established at Tientsin.

In 1914 a large force of marines and sailors was landed at Vera Cruz, Mexico, where it participated in the occupation of that city and where it remained until the close of the year. From 1915 until 1934 a brigade of marines was stationed in Haiti to aid in preserving law and order, and in July 1916 a strong force was sent to the Dominican Republic, where it remained until August 1924, after the restoration of civil

government

Five weeks after the United States entered the World War in April 1917, the Fifth Regiment of marines sailed for service in France and shortly thereafter the Sixth Regiment and the Sixth Machine Gun Battalion followed the Fifth Regiment overseas. These three units were organized into the Fourth Marine Brigade and assigned, as one of the two infantry brigades, to the Second Division of the American Expeditionary Force, later commanded by Gen. John A Lejeune, USMC. For an account of what the marines did in the World War see MARINES IN FRANCE IN 1918.

On numerous occasions the marine corps has rendered efficient aid to the civil authorities in the United States. Early in the 1920's and again in 1926 following a series of mail robberies it was called upon to guard the United States mails. In 1927 a strong force was hurried to Nicaragua to protect Americans and was kept in that country until 1933. What is known as the Fleet Marine Force was organized in 1927 as an integral part of the United States Fleet, to replace the units previously known as the East and West Coast Expeditionary Forces. To it the famous Fifth and Sixth regiments were assigned as infantry units, after reorganization. Special troops have been added to the Fleet Marine Force from time to time, and in September 1939, when the President declared a limited emergency and increased the marine corps from 18,000 to 25,000 still other units were added and new ones created. In 1940, due to the war in Europe and to conditions in the Far East, the authorized strength of the marine corps was further increased to 38,600 officers and men. Over one-half of the corps is assigned to the Fleet Marine Force which has its headquarters at San Diego. Practically all marine corps aviation (over 1,900 officers and men) is assigned to the Fleet Marine Force.

In the fall of 1940 approximately 2,000 marines were serving in China and the Philippines under the commander in chief of the Asiatic fleet. About 2,000 men were serving in naval stations in the Hawaiian Islands, Guam, Panama Canal Zone and at Guantanamo Bay, Cuba. Approximately 5,000 marines were serving at navy yards, munition manufacturing plants, ammunition depots and storage depots to protect property valued in excess of \$1,000,000,000, and about 4,000 were on board ships of the navy. The new United States naval policy, commensurate with the "two-ocean fleet" expansion program, has necessitated increasing the strength

of existing marine units and the creation of new units for service on newly commissioned vessels. Marine detachments form a part of the complement in all American battleships, aircraft carriers, heavy cruisers, and in the later type of light cruisers, as well as in other types of com-

bat ships.

During the Second World War the Marine Corps was recruited to a strength of nearly 500,-000 officers and men. It served almost entirely in the Pacific theater of operations, and took part in numerous engagements with the Japanese, notably on Guadalcanal, Iwo Jima and Okinawa Marine casualties in the Battle of Iwo Jima numbered 19,938, including 4,189 killed In the Battle of Okinawa the 3d Marine Amphibious Corps joined the 24th Army Corps to comprise the Tenth Army which struck at Okinawa, principal island of the Ryukyus chain, on Easter Sunday, April 1, 1945. Marine casualties in this battle, which ended June 21, 1945, totaled 16,013, including 3,044 killed. On Sept. 3, 1945, Brig Gen Lawson Sanderson, commanding the 4th Marine Air Wing, accepted surrender of the Japanese

garrison on Wake Island.

The Marine Corps maintains a reserve corps, and during the Second World War recruited a Woman's Reserve Corps, which at its peak in

1945 numbered 19,000

MARINE ENGINE. See DIESEL ENGINE.

MARINE ENGINEERING. That branch of engineering which pertains to the design and operation of the machinery required for propelling, working and handling of ships. The last two items include such details as steering, loading and unloading cargo, and in general embrace a highly complex organization of electrical and mechanical devices designed for the safety and comfort of the passengers and crew. Marine machinery must possess the highest degree of reliability without being unduly heavy or bulky.

The early history of marine engineering is a story of the development of the steam engine beginning with the rudimentary but somewhat successful pumping engines used for pumping water from mines. These early steam plants were so heavy and inefficient it was doubted if a ship equipped with an engine could ever carry enough fuel to complete a long voyage. The first steam-ships were simply sailing vessels with engines; the limited bunker space would permit using the engines only part of the time.

The foremost problem of the marine engineer has always been one of reducing the weight and improving the efficiency of the power plant so that the ship, by carrying less machinery and fuel, will be able to carry more cargo.

The machinery aboard a ship is divided into two classes: (1) main engine; (2) auxiliaries, Fig 1 shows an elementary marine steam plant. It includes only the equipment necessary to drive the propeller All of this machinery except the boilers and triple expansion engine are main en-gine auxiliaries The other class of auxiliaries includes such items as electrical generators, steering engines, anchor windlasses, refrigerating machines, etc. Another way of classifying auxiliaries is to refer to them as either machinery space auxiliaries, or deck and hull machinery

The cycle of steam and water in the elementary power plant is indicated by the arrows in Fig. 1. The steam from the boilers passes suc-

cessively through the three cylinders of the engine and is finally exhausted to the condenser. The circulating pump forces sea water through tubes in the condenser while the exhaust steam condenses on the outside surface of these watercooled tubes. A vacuum is maintained in the condenser by the air ejector. The condensate pump discharges the condensed steam to the hot well which is filled with trays of some filtering medium, as loofa sponges, which removes any oil which might be carried over from the main engine (If the oil were returned to the boiler it would cause overheating and perhaps failure of the tubes or plates.) The water in the hot well is pumped back to the boilers via the feed heater. The feed heater is required by law to prevent stresses in the boilers due to the entrance of cold water The heater receives its heating steam from auxiliary exhaust steam that would otherwise be wasted and its use increases the efficiency of the entire plant Hence, it should be used regardless of the safety requirements.

The main condenser performs two important functions (1) it conserves the fresh water needed to supply the boilers as feedwater, (2) it increases the efficiency and power output of the entire plant. The fact that a condensing engine exhausts into a vacuum instead of the atmosphere increases the power produced from a given quantity of steam supplied. Also the feedwater taken from the hot well, or feedwater tank as it is sometimes called, will be hotter than water taken from the ship's tanks, thus less heat will be required in the feedwater heater and boiler to transform it into steam. The condenser referred to above is a surface condenser wherein the cooling water and steam are separated by the walls of the tubes so that the boiler water recovered is literally distilled water. Another type of condenser is used on vessels which operate in fresh water, or in harbors where their fresh water tanks can be refilled readily. This condenser is called a *jet condenser*, or *direct contact condenser* The cooling water is sprayed directly into the chamber which receives the exhaust steam A vacuum is produced, but the resulting mixture of condensed steam and cooling water is unfit for boiler feed unless the cooling water itself is free from impurities. Early seagoing steamships used sea water in their boilers with reasonable success according to the standards of the day. The steam plants were inefficient but the low steam pressures and types of boilers used did permit the use of sea water which was a very important consideration in the absence of

a dependable surface condenser.

The demands of modern watertube steam generators in regard to boiler water can only be obtained with a tight surface condenser plus a scientific procedure of feedwater treatment to prevent corrosion and formation of scale. The deposit of scale on the heating surfaces can be prevented by chemical treatment of the boiler water, while corrosion can be prevented by maintaining the water slightly alkaline and by removing dissolved oxygen before the water enters the boiler. Oxygen can be kept out of the boiler to a satisfactory degree by using the deaerating type of feedwater heater wherein the water and heating steam are brought into direct contact. The water enters the heater in a fine spray which exposes the highest possible surface contact with the steam jets. Under the influence of the high velocity steam the air becomes disengaged from

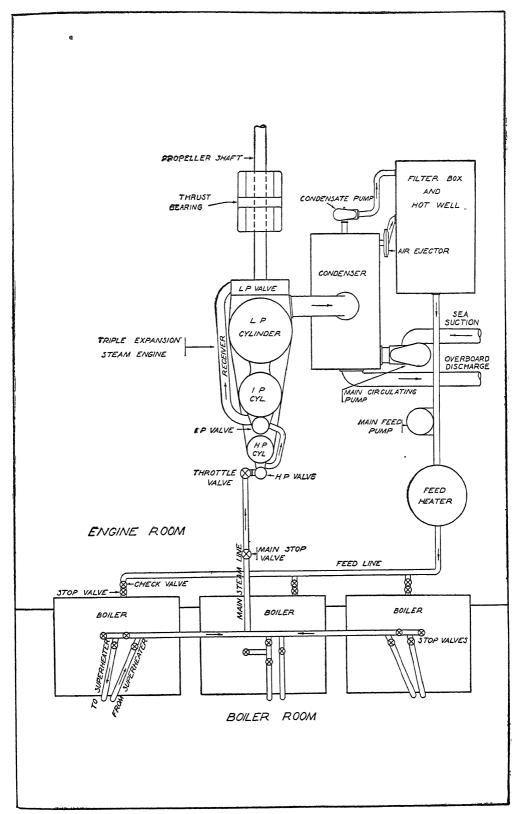


Fig. 1. Elementary Marine Steam Plant.

the water particles and joins the steam flow which carries the air out of the heater. There is no waste of steam as provision is made for con-densing it after it has cleared the air from contact with the water. In the elementary steam plant of Fig 1, the air is removed from the condenser by a steam-jet pump which discharges into the hot well Since the hot well is open to the atmosphere, this arrangement permits the water to absorb considerable air. An improvement is found in the closed feedwater system where the open hot well is replaced by a closed surge tank, and where the air ejecter discharges into a separate condenser vented to the atmosphere.

Propulsion.—Early steamships were propelled by paddle wheels not only because this method of mechanical rowing was the most obvious but because the paddle wheels were suitable for the slow-turning engines then in use Paddle wheels proved entirely unfit for seagoing vessels. If the wheels were properly submerged when the ship was fully loaded, they would probably be entirely out of water with the vessel in light condition; also the paddles were quite likely to be damaged by waves in rough weather. Paddle-wheel propulsion is well adapted to vessels of shallow and more or less constant draft, such as river steam-

The screw propeller, generally referred to simply as a propeller or a screw, is the most efficient and widely used method of propulsion. It began to replace the paddle wheel about 1837 In the first installation the engines were adaptations of the paddle-wheel engines which were fairly satisfactory at rotative speeds on the order of 30 revolutions per minute or less, but were dangerous to the wooden hulls at higher speeds on account of the vibration due to unbalanced forces. For good efficiency the propeller requires a speed of about twice that of a paddle wheel. These higher speeds were frequently obtained by the use of gearing involving wooden-toothed gears on the engine shafts driving smaller iron gears on the propeller shafts. All of these engines were a practical failure due to their great weight as well as their mechanical infirmities. The propeller came into its own with the development of better balanced multicylinder steam engines that could be run fast enough to be connected directly to the propulsion shafting. The only restriction on the use of the propeller is sufficient depth of water and draft of hull to allow it to operate completely submerged. Depending upon the size and type of ship, one to four propellers are used, and the ship is designated as single-screw, twin-screw, triple-screw, or quadruple-screw. See NAVAL ARCHITECTURE—Model Basins; SCREW PROPELLER.

Jet propulsion is too inefficient to be considered as a general means of moving a ship through the water. Its principle is simply one of pumping a submerged jet of water opposite to the direction in which the vessel is to be propelled. In order to obtain high efficiency the jet of water must be larger in diameter than is practicable to obtain from any type of pump. Jet propulsion can be used in the special case of a fire boat where the large pumping capacity can be used as effective if not efficient propulsion

while running to or from a fire.

Main Engines.—There are two general types of power plants used aboard ship-steam plants and internal combustion engines.

The extent to which a steam engine will convert steam into mechanical power depends primarily upon its ability to permit expansion of the steam within the engine. In the multistage reciprocating engine the steam is admitted and expanded successively in two, three, or four cylinders depending upon whether it is a compound, triple expansion, or quadruple expansion engine The extent to which the steam can be expanded is obviously limited by the size of the low-pressure cylinder. In the steam turbine the steam passes through the nozzles and blading at a high velocity which permits a large volume of steam to be accommodated and gives a much higher ratio of expansion than would be practicable in a piston type of engine. However, this inherent efficiency of the steam turbine is not fully gained in turbines of small size. In powers under 3,000 hp. (horsepower) the reciprocating engine becomes competitive with the steam turbine on a basis of economy. The exact line of demarcation depends upon the individual reciprocating engine and turbine being compared For very high powers the steam turbine has no competitor. It has been built in units as large as 50,000 hp. per shaft

The principal internal combustion engine used for ship propulsion is the Diesel engine. It has been built in all sizes up to 10,000 hp. It has the lowest fuel rate of any prime mover, but in general requires a higher grade of fuel oil than

steam boilers.

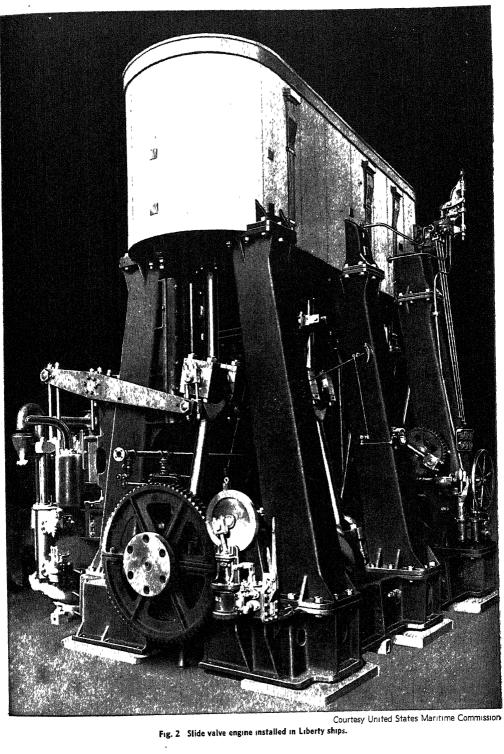
The question of superiority of one type of propelling machinery over any other involves many factors such as relative fuel costs, importance of weight ratio of fuel to cargo, facilities

for maintenance and repair, etc.

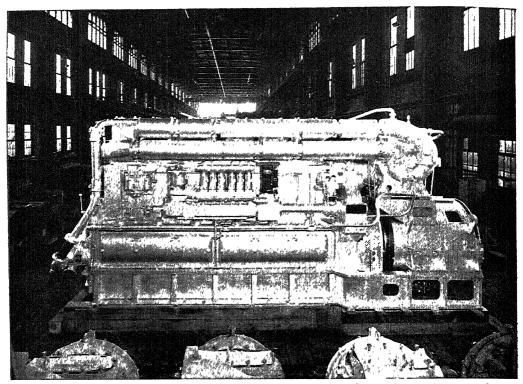
Transmission of Power.—There are three ways of transmitting power from the main engine to the propeller. (1) By direct drive when the engine is connected directly to the propeller shaft. In this type of drive the rotative speeds of the engine and propeller cannot be selected independently, which may result in a very ineffi-cient combination. The screw propeller requires a relatively low rotative speed for good efficiency whereas the steam turbine requires a high speed. The early direct-drive turbine vessels such as the Leviathan, Majestic and old Mauretania were inefficient because the shaft speed in each case was a compromise between the most effi-cient propeller speed and the most efficient turbine speed. The reciprocating and rotary steam engines, and the Diesel engine, can all be used successfully in direct drive.

(2) The geared drive was developed mainly to take advantage of the inherent efficiency of the steam turbine. Most of the turbine installations employ double reduction, double-helical gears with speed reductions running as high as 80 to 1. Single-reduction gears are used only on larger high-speed vessels such as the SS West Point (formerly the SS. America). The single-reduction gear is used for geared Diesel jobs where the required speed reduction is not as high as for steam turbines. The purpose of the geared Diesel drive is to reduce machinery weight and provide greater reliability and ease of maintenance through the use of one or more small high-speed units instead of one large slow engine directly connected. Also, the power which can be transmitted by one shaft is considerably greater in the multiengine drive. In the geared-Diesel it is good practice to introduce a slip-type coupling

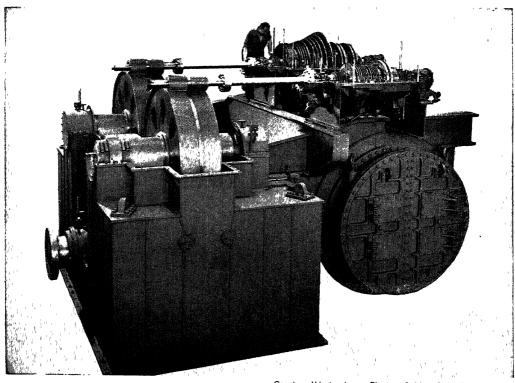
MARINE ENGINEERING



MARINE ENGINEERING

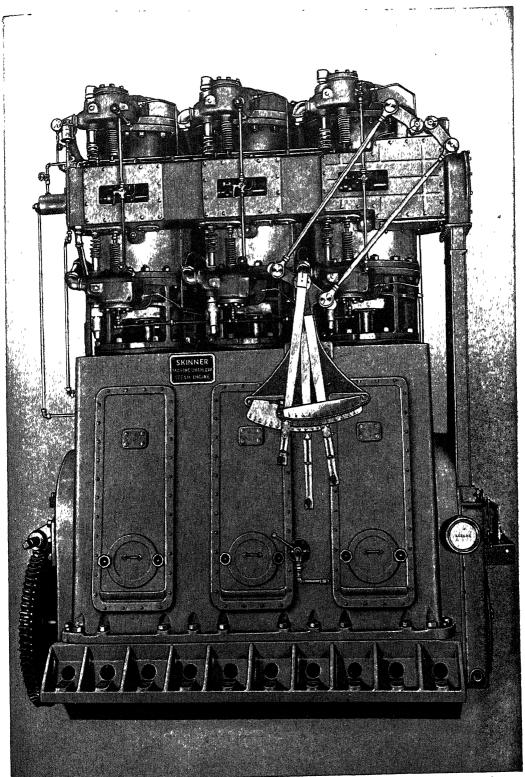


Courtesy American Locomotive Company Fig 3 Supercharged Diesel electric unit for direct-current electric drive



Courtesy Westinghouse Electric & Manufacturing Company Fig. 4. 8,500-shaft horsepower geared-turbine propulsion unit used in Victory ships.

MARINE ENGINEERING



Courtesy Skinner Engine Company

Fig 5 Three-cylinder uniflow marine engine.

MARINE ENGINEERING

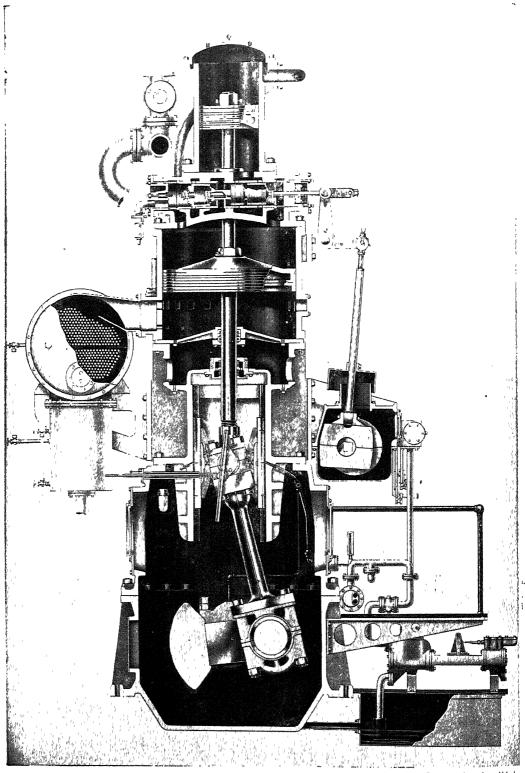


Fig. 6. Ajax marine engine.

Courtesy Ajax Iron Works

MARINE ENGINEERING

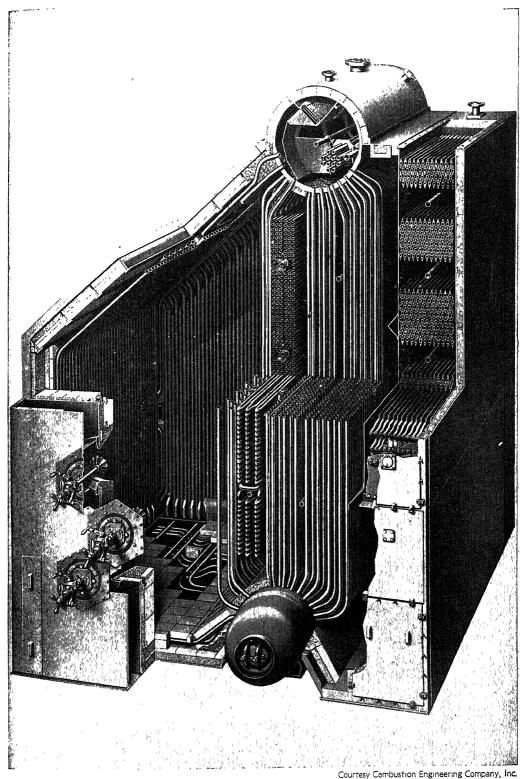


Fig 7. Marine two-drum boiler as installed in the Maritime Commission's C-2 vessels.

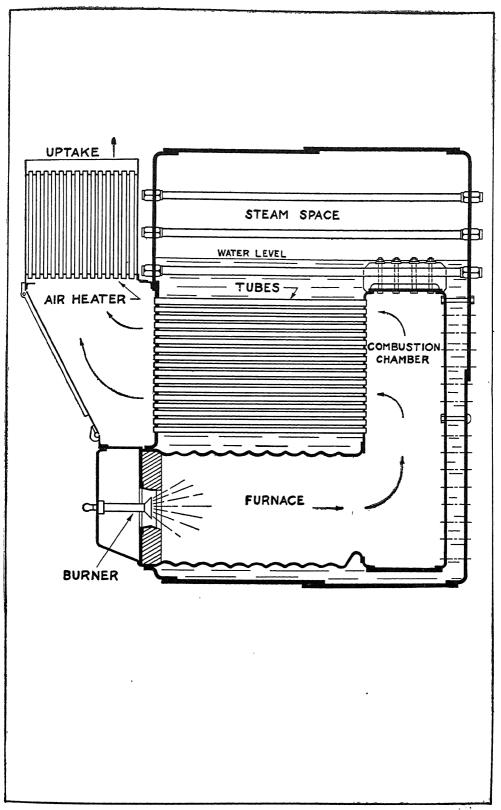


Fig. 8 Longitudinal Section of a Three-furnace Cylindrical, Return-tube (Scotch) Boiler.

between each engine and the gears so as to minimize the torque variations transmitted by the gear teeth The two types of couplings used are

the electromagnetic and the hydraulic

(3) The electric drive is used primarily as a speed reducer. It permits the speed of the electric motor and propeller to be adjusted independently of the engine and generator speed. Electric energy used to drive the propulsion motor can be generated by any type of prime mover. However, steam turbines and internal combustion engines are the only engines used to any great extent in connection with electric drive. In ships of large powers alternating current is preferred to direct current on account of less weight and cost, and greater simplicity. The reduction in speed is obtained by designing a propulsion motor with more poles than the generator. Thus for alternating current the speed ratio between the generator and motor is fixed for any one pole arrangement. Although the Diesel engine has been used to some extent for alternating current electric propulsion the turboelectric plant is the outstanding example of this drive. On the other hand, direct current propulsion finds its greatest usefulness in Diesel-electric jobs

Aside from the matter of speed reduction the electric drive has other desirable features. In either a-c or d-c jobs it gives full power astern without changing the normal ahead operation of the main engine. In the case of direct current it also gives an exceedingly fine control of power and speed. Also, the electric drive permits pilot house control of the propulsion motors. These last two features are particularly desirable for

tugs and icebreakers.

Marine Boilers.—These are of two general types—firetube and watertube. The Scotch marine boiler, shown in Fig. 8, is the outstanding example of the firetube type As the name implies, the hot products of combustion pass through the tubes. This type of steam generator is obsolete as far as new construction in the United States is concerned. However, many hundreds are in use in existing vessels Contrary to this one principal type of firetube boiler, watertube boilers are manufactured in a variety of forms. In the past, each boiler manufacturer built a particular type which was referred to by its proprietary name, such as "Babcock & Wilcox" Since the various boiler companies now build all types, such designations are meaningless to one not already familiar with the boilers concerned. Fig. 9 is a diagrammatic sketch of a water-tube boiler showing the path of water and steam. It should be noted that there are three distinct sections of the boiler: (1) The preheating section generally referred to as an "economizer," because originally it was added to older designs in order to increase the economy of the boiler; (2) the generator section where the water vapor or steam is formed; (3) the superheater section where additional heat is added to the steam The efficiency of a steam plant increases with increase in pressure and temperature of the steam. Therefore, boilers for modern steam plants must deliver steam at both high temperature and high pressure Due to consideration of strength of materials the practical limits for a marine steam plant are 1,500 pounds per square inch and 950° F.

The obsolescence of the Scotch boiler is due mainly to its great weight and bulk, and the impracticability of building it for steam pressures higher than 220 pounds per square inch.

However, the Scotch boiler does possess some advantages over the watertube such as its ability to use impure feedwater; also, its large volume of contained water makes it less sensitive to changes in rate of firing or feed control. The Scotch boiler is desirable in cases where weight, space and high thermal efficiency are not con-

trolling factors.

Steam Turbines.—There are two basic types of steam turbines—mpulse and reaction. In the impulse type the steam expands in stationary nozzles where the heat energy is converted to kinetic energy by virtue of the increase in velocity of the jet. The driving force is created by the impulse of the high velocity steam jet on the blades, similar to the action of a water wheel. In the reaction turbine the steam expands in the passages of the moving blades with a corresponding drop in pressure and increase in velocity. The reaction to the force required to accelerate the steam is the driving force on the blades. This is similar to the rocket effect of jet propulsion.

The characteristics of the two types of turbines are such that a greater change of energy occurs in a set of nozzles in an impulse turbine than in a blade row of a reaction turbine. Thus, impulse turbines are generally more compact than reaction turbines. All small turbines are of the impulse type, whereas large turbines may be either impulse or reaction, or a combination of both types. The combined turbine takes advantage of the fact that the impulse blades are more efficient at the high pressure, inlet end while the reaction blades are more efficient at the low-pressure end. In geared turbine drives the turbine is divided into two or sometimes three casings, which are actually separate turbines, through which the steam flows in series. This division of turbines reduces the load that any one reduction gear pinion must transmit. Also, the problems of thermal expansions and contractions are reduced by the smaller units

Reversing turbines are required for direct or geared drives. The reversing turbine is a separate turbine mounted in the casing of the low-pressure turbine at the exhaust end. When the ship is going ahead the astern turbine runs idle opposite to its natural direction of rotation. The resulting drag on the ahead turbines is kept as small as possible by making the astern element compact without too much regard for its efficiency. When running astern the windage losses in the ahead turbines are considerable and the final power available for astern running is generally less than half the ahead power. However, this is generally sufficient. If for any reason full astern power is required from a turbine, the electric drive is advisable.

Reciprocating Steam Engine.—All modern reciprocating engines used for marine propulsion are of the multicylinder vertical inverted type. The primary difference in the various forms is one of valve action, that is, the manner in which the steam is controlled during the events of admission, expansion and exhaust. A secondary distinction relates to the different ways of arranging the cylinders and connecting the pistons

to the crankshaft.

The slide valve engine is the most common type. The two-cylinder compound is used mainly in tugs with the triple expansion predominating in seagoing cargo vessels. The slide valve engine installed in Liberty ships has one slide valve per cylinder which controls admission and exhaust of steam at both top and bottom ends

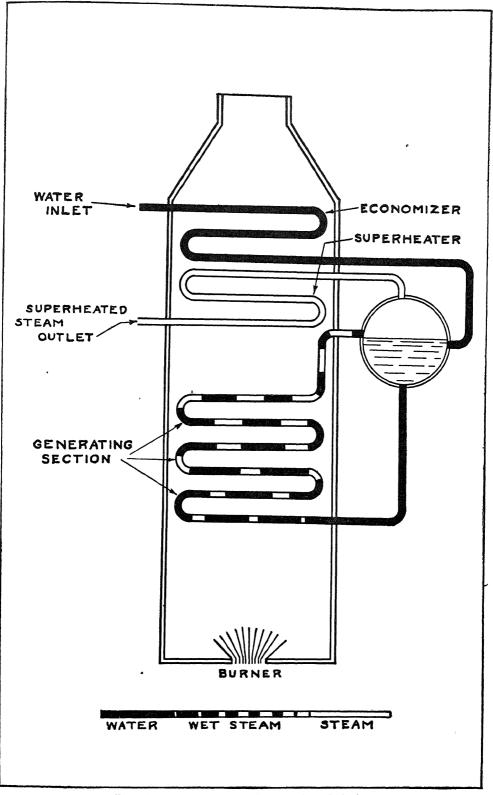


Fig. 9. Diagrammatic Representation of a Watertube Boiler.

Typical of all slide valve engines, it is simple

and reliable but quite inefficient.

The uniflow marine engine, as built in the United States by the Skinner Engine Company, has a poppet valve at each end of the cylinder to control the admission of steam The exhaust is controlled, as in all uniflow engines, by ports in the middle of the cylinder which are uncovered by the piston at the end of its stroke The number of cylinders used ranges from 2 to 8 Each cylinder is independent in regard to steam flow; i.e, each cylinder receives a charge of steam at the beginning of the stroke and exhausts directly to the condenser. The poppet valves are operated by cams and can be controlled so as to give the much desired constant point of admission with

variable cut-off.

Woolf Engine—A development of the steam engine by Woolf in 1804 was a compound engine in which the high-pressure cylinder exhausted directly into the low-pressure cylinder. A recent revival of the Woolf principle occurs in the Ajax engine. The engine, as usually built, consists of 3 units on a 3-crank shaft. Each unit, is a steeple compound arrangement with the high-pressure cylinder on top of the low-pressure cylinder, both pistons being on the same rod. Each cylinder takes steam on one side of the piston only. The high-pressure takes steam on the bottom side and then on the down stroke exhausts directly to the top side of the low-pressure cylinder. The low-pressure cylinder is strictly single-acting uniflow and exhausts to a condenser attached to the side of the engine One valve of the piston slide-valve type controls both admission to the high-pressure cylinder and the combined event of high-pressure exhaust and low-pressure admission.

The Lentz engine is a European development of the Woolf principle. It is built as a double compound engine having two high-pressure and two low-pressure cylinders. Each piston is on a separate crank with 180° crank angle between each high- and low-pressure cylinder. Thus the low-pressure cylinder of each unit is always moving opposite to its adjacent high-pressure cylinder. The steam to the doubleacting pistons is controlled by poppet valves, six of which are required for each pair of cylinders.
The only difference between the Lentz engine and an ordinary double-acting, poppet-valve counterflow is the manner in which the steam is exhausted directly from the high-pressure cylinder to the low-pressure instead of first being exhausted to a receiver and then being admitted to the low-pressure. This arrangement, however, gives a more efficient engine due to the elimination of the receiver and two valves between each pair of cylinders.

Reciprocating Engine Performance.--There is little difference in the relative heat efficiencies of the three engines just described; all of them are definitely superior to the standard slide valve engine. However, the attempt to increase the efficiency of any reciprocating engine by using higher-temperature steam aggravates the problem of lubricating the piston and cylinder walls. The serious aspect of the problem is not the actual providing of lubrication but the separation of the oil from the feedwater before it is re-

turned to the boilers.

Warren Rotary Steam Engine.—Although this engine has no reciprocating parts, the driving torque is produced by direct steam pressure. The

vanes on the rotor are virtually rotating pistons. Referring to Fig. 10 it will be noted that the steam is admitted from the center of the rotor to the spaces behind the vanes By varying the opening of the port A any desired point of cut-off can be effected Exhaust occurs when the vane uncovers the port "B." Steam is again admitted behind the vane when it has passed through the meshing space of the obturator. The cycle is similar to the uniflow engine with the compression event eliminated. The engine can be built with any desired number of stages having a total ratio of expansion greater than would be practicable in a reciprocating engine. The normal rotative speed of this type of engine is much less than that for a steam turbine It can be coupled directly to electric generators and in case of a propulsion engine requires a geared speed reduction of only eight or ten to one for low propeller speeds and in many cases can be direct-connected Although superheated steam can be used where high heat efficiency is desired, the engine is able to handle wet steam at the low-pressure end, and high ratios of expansion can be used without requiring highly superheated steam as in the case of a steam turbine The chief advantage of this engine is the fact that it does not require internal lubrication and thus eliminates the problem of oil-contaminated feedwater which is common to all other pressure-type steam engines.

Combined Reciprocating Engines and Turbines -Although some original designs have used reciprocating engines and turbines in combination, this arrangement is more common in conversion jobs where the power and efficiency of the propulsion plant have been increased by adding an exhaust turbine to the original re-ciprocating engine. The turbine must be connected through reduction gears to the propulsion shaft just aft of the main engine. In order to secure full benefit from the combination it is necessary to increase the original steam pressure and temperature and install a new condenser cap-

able of producing a higher vacuum.

Diesel engines—of all general types are used aboard ship as either main engines or auxiliaries. For a more detailed discussion see Internal Combustion Engine; Diesel Engine.

Thrust Bearing.—The interaction of the pro-

peller and water produces a thrust on the propeller shaft A special thrust bearing must be fitted in the shafting between the propeller and engine, or gears, so that this axial force which propels the vessel will be transmitted directly to the hull instead of to the propelling machinery The modern type of thrust bearing consists of a collar on the shaft which bears against Babbittfaced shoes secured to the casing of the bearing. The casing is bolted firmly to the hull Since the shoes are on both the forward and after sides of the collar the propeller thrust will be transmitted to the hull whether going ahead or astern.

Propeller.—Although the form of a screw propeller is similar to the helicoidal screw thread, the action of an individual propeller blade can be considered as a rotating airfoil. The thrust produced by a marine propeller is directly comparable to the lift of an airplane wing. (See AERONAUTICS.) Propeller design is based on tests of scale models made either in open water or in closed variable pressure tunnels. In comparing the behavior of a model and the full size pro-

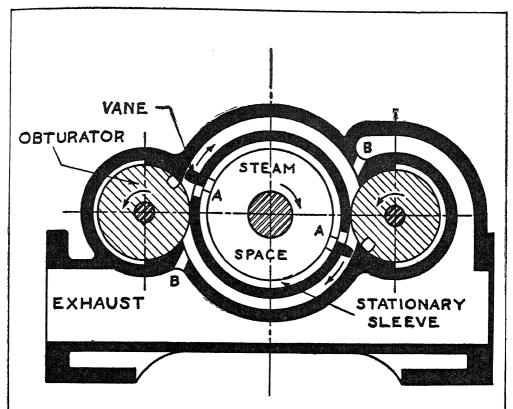


Fig. 10. Warren Rotary Steam Engine,

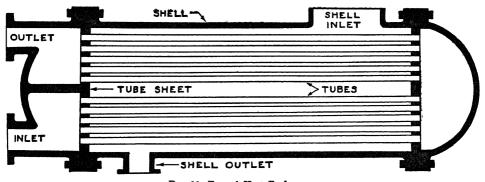


Fig. 11. Typical Heat Exchanger.

peller it is necessary to consider the effect of propeller size upon such quantities as thrust, power and torque A study of dimensional analysis reveals the conditions under which a model must be operated so that its performance can be used to predict full size performance For instance, one of the conditions is that the ratio of the pressure acting on the model to the pressure acting on the full size must be the same as the ratio of their linear dimensions. That is, if the full size propeller has a diameter 20 times the diameter of the model, the pressure on the model must be one twentieth that on the full size. Since pressure acting on a ship's propeller is mainly atmospheric, it is necessary to operate the model in a partial vacuum to obtain comparable pressure conditions Fortunately, this pressure relationship does not appreciably affect any of the propeller properties except cavitation (cavitation occurs when the flow of water to the propeller fails to follow the blade outline) and most testing can be conducted under atmospheric pressure

Auxiliaries.—Heat exchangers include such items as condensers, evaporators, feedwater heaters, fuel oil heaters and lubricating oil coolers Shell-and-tube construction, as illustrated in Fig. 11, is typical for all of these units Of course, the shape, proportions and details of design will vary for each type of service, but all of them are based on the principle of transferring heat from one medium to another through the walls of the tubes. In the case of heat transfer between condensing steam and water more efficient transmission will be effected if the water is confined to the tubes so that the velocity of flow along the tube walls is uniform

The electric plant aboard ship is becoming more important as the shipboard uses of electricity continue to expand. The first general use of electricity aboard ship at the beginning of the 20th century was confined to lighting On small cargo vessels the "dynamo" would be shut down during the day and oil lamps would be used in the engine and fire rooms On modern vessels electric power is as common as on shore with additional uses such as the gyrocompass, automatic steering and other navigational aids. In some vessels all auxiliaries and hull machinery are driven by electricity. Direct and alternating current are both used, with direct current pre-dominating, except in later naval vessels. The electric generators for auxiliary use are generally driven by geared steam turbines or Diesel engines. Small size generators, particularly those in older ships where they are referred to as dynamos, are driven by single cylinder recipro-

cating steam engines.

Pumps.—The pump is probably the oldest piece of mechanical equipment in marine use. In the development of marine engineering many new types have been invented. The centrifugal and other rotary types are desirable on account of compactness, uniform flow and because they can be driven directly from the shaft of an electric motor or steam turbine. However, the reciprocating piston type pump driven by direct-acting steam pistons is still common. The efficiency of the piston pump is high, but the steam end of a direct-acting pump is very inefficient. The desirable features of the piston pump are

retained in the power pump which gives an efficient drive by using a system of gears, crankshaft and connecting rod to connect an electric

motor to the reciprocating pistons.

Fuels.-Oil is the supreme fuel for marine service It is the only practicable fuel for internal combustion engines and is superior to coal for use in steam generators. For equal heat values the space required for oil is about 65 per cent of that required for coal. Also, oil can easily be stowed and removed, as required, from double bottoms and tanks located in remote parts of the ship, whereas coal must be bunkered reasonably close to the fireroom in space that is valuable for cargo or other purposes. Hand firing of coal requires considerable labor and is generally very inefficient In the case of mechanical stokers and pulverized coal installations the labor involved will be about the same as that for oil burning, as far as the actual firing of the coal is concerned However, there will be additional labor in trimming coal bunkers and feeding the hoppers of the pulverizers or stokers. In the matter of boiler design, oil firing imposes fewer restrictions on the size and shape of the boilers. This is a very important feature in the higher powered vessels

For additional information on machinery used aboard ship see Engine; Pumps and Pumping

MACHINERY; STEAM ENGINE, TURBINE.
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MARINE INSECTS. Insects have not only invaded rivers and lakes, they have established themselves to some extent at least, along the margin of the sea. On a sunny day by the shore myriads of flies may be seen hovering over the seaweed cast up by the tide. These have been developed from grubs which live and feed in the decaying weed, and are able to bear immersion twice daily. Around the rock-pools many midges may be noticed. Their grubs feed on growing green seaweed, and spend their whole life in the salt water, breathing the dissolved air, as do their fresh-water relations, by means gill-filaments, or simply through the surface of the skin Many species of beetles inhabit the shore, and are submerged twice daily, when they lurk under stones or burrow into the sand; their hairy bodies are not easily wetted, and in one of the best-known marine beetles (Aepus) there are paired air sacs in the hind-body which are believed to act as reservoirs for breathing while the tide is up Several kinds of very small springtails may be seen on the surface of the rock-pools at low tide; probably when the water rises they retire into crevices of the rocks. They are covered with a very fine, dense pile, and it seems impossible to wet them.

The absence of wings is a common character

^{1"}Dimensional Analysis of Model Propeller Tests" by Edgar Buckingham, Journal of the American Society of Naval Engineers, vol. XLVIII, No. 2, May 1936.

among the seashore insects. The beetles of the genus Aepus are wingless, and so is the small bug Aepophilus often found in their company, as well as the female of the midge Clunio, whose mate, though winged, appears not to fly, but to use his wings as sails as he skims over the surface of the rock-pools. "The tendency of insects on oceanic isles to lose their wings has often been noticed" says Carpenter, "and the loss of the power of flight explained as an advantage, since insects which do not fly cannot be blown out to sea. Possibly the absence of wings in so many seashore insects can be explained in like manner. Several genera of pond skaters have one or two species which frequent the water of estuaries and harbors; these are in all cases wingless, though their fresh-water relations are, as a rule, winged."

The extreme of adaptation to marine life is shown by the bugs of the genus Halobates, also belonging to the family Hydrometridae, with their short anchorlike forelegs and their immensely long and slender middle and hind-legs, the middle shin and foot being fringed with long hairs. The elongate wingless fore-body of these insects and the greatly reduced hind-body give them a most peculiar and characteristic appearance, and the dense pile wherewith they are clothed keeps them dry. They have been observed gliding over the calm seas of the tropics, often hundreds of miles from land, or clinging to drifting substances whence they could suck food. Consult Carpenter, G. H., Insects, their Structure and Life (1899); Miall, Natural History of Aquatic Insects (1895).

MARINE INSURANCE. See Insurance, Marine.

MARINE SEDIMENTS, those laid down in the ocean, in contrast to terrestrial deposits laid down on land. They are usually characterized by uniformity in thickness and character over rather large areas, and commonly contain fossils of animals known to live only in the sea. The common types are conglomerates, sandstones, shales and limestones. See Oceans, section on Ocean in article on Geology, and section on Sedimentary Rocks in article on Rocks

MARINER'S COMPASS. See Compass, Mariner's.

MARINES IN FRANCE IN 1918—Belleau Wood, Soissons, etc.—On May 31, 1918, the Second Division of the American Expeditionary Forces was selected to go to the relief of the French Army retreating before the German drive. The Fifth and Sixth Regiments and the Sixth Machine Gun Battalion of United States Marines, forming the Fourth Brigade of the Second Division, commanded by Brigadier General James Gharbord, were in reserve in a rest area at Montdidier, when the order to the front arrived. Reaching their destination in the early morning of June 1, they moved into line in support of the French. It was the opening of the Battle of Chateau Thierry, and found the German advance facing the Americans. Hill 165 was the enemy's objective, but the marines as expert riflemen "calmly set their sights and aimed with the same precision that they had shown upon the rifle ranges at Paris Island, Mare Island and Quantico." Their machine guns also took up the fire. The artillery soon backed the riflemen and, with shrapnel, added to the killing power; the Ger-

mans ran to cover raked by the American fire. This day's battle halted the German drive on Paris. But the city of Chateau Thierry remained in the enemy's hands; its liberation involved prior capture of the Bois de Belleau which was very strongly fortified, as were the flanking villages of Bouresches and Torcy. On June 6 at 5 PM. the Marines, attacking with the bayonet, captured Bouresches and penetrated Belleau Wood. The Germans resisted fanatically, but the marines with their associated infantry brigade so exhausted the three enemy divisions (197th, 237th and 10th) that the 5th Guards, and then the 28th, had to be thrown in as reinforcements. Thus, five German divisions were consumed in a three-week conflict. The last enemy nests were captured on the 28th. In the Aisne-Marne campaign launched on July 18 the brigade fought again brilliantly near Soissons, then in the St. Mihiel campaign of mid-September. Early in October they defeated the Germans once again east of Rheims. The brigade's total casualties amounted to nearly 400 officers and 12,000 enlisted men. Distinguished Service crosses were awarded to 644 of its members.

MARINETTE, măr-ĭ-nĕt', Wis, city, Marinette County seat, alt 611 feet, on Green Bay, at the mouth of the Menominee River, on the Chicago and North Western and the Chicago, Milwaukee and St. Paul railroads, and state and federal highways, opposite Menominee, Mich, with which it has car ferry connection. Its manufactures and industries include wood boxes, excelsior, gloves, pulp wood insulation, cardboard boxes. Its commercial activities are facilitated by docks for small craft on the river, which flows through the center of the city, and a harbor for lake steamers. The city has a considerable lake traffic, and is a point of entry for the 37th customs district. Marinette's government is administered by a mayor and council. The water system, drawing from Lake Michigan, is publicly owned. The city has a public library and a county general hospital. Its cultural interests include a Little Theater and an acappella choir. The site of the first local sawmill is preserved as a monument to the city's early days, and there is a monument to U. S. Senator Isaac Stephenson (1829-1918), pioneer lumber "baron." Marinette was settled in 1830 on the site of an Indian village, was named for Queen Marinette (Jacobs), a fur trader of the Menominee tribe, and received its city charter in 1887. Pop. (1930), 13,-734; (1940) 14,183.

MARIO, Giuseppe, joo-sĕp'pĕ Mā'rē-ō, MARQUIS DI CANDI, İtalian tenor: b. Cagliari, Sardinia, Oct. 18, 1810; d. Rome, Dec. 11, 1883. After serving in the Sardinian Army he went to Paris, where after two years of musical study he was appointed first tenor of the opera, changing his name at the same time from De Candia to Mario. He made his debut Dec. 2, 1838 as Robert in Robert the Devil, and soon became the leading tenor of the world. His repertoire embraced all the great works of Rissini, Bellini, Donizetti and Verdi. He married the famous singer, Giulia Grisi, in 1854 and together they made an operatic tour of the United States. In his later years after his retirement from the stage in 1871 he lost his fortune through speculations, and the next year made a concert tour in this country.

MARIOLATRY. See MARY.

MARION, măr'î-on, Francis, American soldier. b near Georgetown, S. C., in 1732; d. Pond Bluff, 27 Feb. 1795. He was the youngest in a family of six children. His grandfather, Benjamin Marion, was a Huguenot exiled from France in 1690. At 16 Francis showed his adventurous disposition by embarking on a small vessel bound for the West Indies. It was wrecked and he barely escaped death by starvation. He returned home and worked several years on a farm. In 1760-61 he served in campaigns against the Cherokees. Thenceforth until 1775 he lived on his plantation at Pond

until 1775 he lived on his plantation at Pond Bluff in the parish of Saint John. In 1775 Marion was elected member from Saint John in the South Carolina provincial congress, which adopted the bill of rights and voted money for raising troops He was chosen captain (21 June 1775) and took the field against the British and the Tories. He took part in the capture of Fort Johnson (14 Sept. 1775), and because of his ability in organizing and discipling was promoted to major. He capt and discipline was promoted to major. He participated in the patriot victory (28 June 1776) at Charleston, which gave the Southern States respite from active fighting for nearly three years. Appointed lieutenant-colonel, he led his regiment in the unsuccessful attack on Savannah (September 1779). In 1780 Marion, now a brigadier-general, was obliged to take refuge in forest and swamp Beginning with a handful of men, less than 20, he gathered recruits, fearless riders and good markenan who formed less riders and good marksmen, who formed the famed "Marion's brigade." At times they numbered several hundred. They came and went at their leader's bidding, providing their own equipment and rations. Part of the time they were at work on their farms, planting crops. These rough and ready troopers became the terror of the British regulars and the Tories, although in justice to Marion's men it should be said that they committed no acts of wanton cruelty and burned no buildings on Tory home-steads The stories of his adventures read more like fiction than history. His scouts kept close watch of the enemy's movements, and detach-ments of the brigade struck blow after blow, ments of the brigade struck blow after blow, surprising and capturing small parties of soldiers. At times they united with larger bodies of troops for important engagements. After a vain pursuit, Tarleton named Marion the "Swamp Fox" Failing in his attempt against Georgetown (December 1780), he retired to Swan Island and prepared for a second attack (13 Jan 1781), which was also unsuccessful. Then he joined with Col. Henry Lee in reducing Fort Watson (April 1781). After raiding 200 miles of country he commanded the first line in the battle of Eutaw manded the first line in the battle of Eutaw Springs and took many prisoners. For his gallantry in this engagement he received the thanks of Congress. From 1782 to 1790 Marion served in the State senate and was a member of the State Constitutional Convention in 1790. He opposed harsh treatment of the Tories and condemned the Confiscation Act of 1782. In 1784 he married a wealthy lady, Mary Videau, who survived him with no children. He was a man of attractive personality. Of slight figure, he was capable of great endurance and accustomed to abstinence. As a leader he was admired and beloved. He justly ranks among the heroes of the Revolution. Consult Biography by Horry

and Weems (1815); Simms, 'Life of Francis Marion' (1844); Tarleton, 'History of the Campaigns of 1780–1781' (1787).

MARION, Ala, city, Perry County seat, alt. 263 feet, on the Southern Railway, 60m W. of Montgomery. Situated in a fertile farming region, it handles hay and cotton It has mayor-council government; a city-owned water system; a public library; a federal fish hatchery; and is the seat of Judson College (women), Marion Military Institute, Lincoln Normal School (colored). It was named for Gen. Francis Marion of Revolutionary fame. Pop. (1930) 2,141; (1940) 2,382

MARION, Ill, city and Williamson County seat; alt. 419 feet; 150m. SE of Springfield; on Illinois Central; Missouri Pacific; and Chicago and Eastern Illinois railroads; has an airport. To the west is Crab Orchard Lake (25,000 acres) a federal project. A U. S. Veterans Hospital is near by. Blasting powder, mine drills, batteries, and monuments are manufactured. Despite strong anti-Union sentiment here in the 1860's, two Republican orators and Union officers, Robert G. Ingersoll and John A. Logan (qq.v.) lived in Marion. Pop. (1940) 9,251.

MARION, Ind., city and Grant County seat, alt. 811 feet, on the Pennsylvania; Chesapeake and Ohio; New York Central; and Toledo, St. Louis and Western railroads, 73m. NE. of Indianapolis. It has an accredited airport on several routes connecting major cities. It is a manufacturing city in the midst of the Indiana farm country. Among its manufactures and industries are insulated wires and cables, bottles, radios and equipment, automobile accessories, shoes, and various paper products. The city government is administered by a mayor, a council, and a board of public works. The water system is municipally owned. Marion has a public library, a museum, a general hospital, and a veterans' hospital. It is the seat of Marion College (coeducational). The first land entry in Marion was made in 1825. Grant County, organized in 1831, was incorporated in 1839. The city was incorporated in 1889. It was named in honor of Gen. Francis Marion of Revolutionary War fame. Pop. (1930) 24,496; (1940) 26,767.

MARION, Iowa, city in Linn County; alt. 848 feet; on Indian Creek; 6m. NE. of Cedar Rapids; on the Chicago, Mulwaukee, St Paul and Pacific Railroad, of which it is a division point, with shops and yards. It is in a region producing general crops, cattle, and hogs Its fine shade trees have won for it the nickname of Grove City. Marion was once the county seat; Cedar Rapids now holds that position. A mill built in 1863 is still operating, and there are in the city chick hatcheries and a factory making sack balers. Marion was settled in 1839, and was named in honor of Gen. Francis Marion (q.v), officer in the Revolutionary army. Pop. (1930) 4,348; (1940) 4,721.

MARION, Kans., city and Marion County seat; alt. 1,310 feet; on the Cottonwood River; 50m. NE. of Wichita; on the Rock Island and the Santa Fe railroads. It is in a hard wheat area and has grain mills, poultry and egg packing plants. Mennonites from the Crimea settled in the county in 1874 and 1875, and developed the raising of hard winter wheat. The city was incorporated in 1875. Pop. (1940) 2,086.

MARION, Ohio, city and Marion County seat; alt 986 feet; 46m. N. of Columbus; on the Erie; Cleveland, Cincinnati, Chicago, and St. Louis, and Chesapeake and Ohio railroads, with a municipal airport. In a farm region, it is a railroad and manufacturing center, famous since 1874 for its steam shovels, tractors, road rollers and fa.m implements. Railroad shops, foundries, and factories making steel vaults, steel bodies, locks, ornamental glass, silk goods, dresses, cigars, dairy and soybean products are here. An early settler, Jacob Foos, found a fine water supply at this site. After two years as Jacob's Well, the place was named Marion in 1822 and became county seat. At 19, Warren G. Harding (qv.) became proprietor of the Marion Star. The house in which he campaigned for the presidency in 1920 is preserved as Harding Museum; and a mile south is the handsome Harding Memorial Marion became a city in 1890 Pop. (1940) 30,817.

MARION, S. C., city and Marion County seat; alt 68 feet; 21m. E. of Florence; on the Atlantic Coast Line Railroad. It is the business center for a cotton, tobacco, and timber region; local industries produce cotton yarn, cottonseed oil, veneer, boxes, lumber, and brick. It was settled in 1800 as Gilesboro; in 1830 renamed Marion, honoring Francis Marion, the «Swamp Fox» of the Revolution. It was incorporated as

a city in 1900. Pop. (1940) 5,746.

MARION, Va., town and Smyth County seat; alt. 2,124 feet; in the Walker Mountains; on Holston River; 45m. NE of Bristol; on the Norfolk and Western Railroad. In a cattle, corn, Burley tobacco, and lumber region, with limestone and manganese deposits. Marion has manufactures of furniture and tool handles, shirts and shorts, and silk hosiery. Here are Marion College, a junior college for girls, and the Southwestern State Hospital for the insane. The hero of King's Mountain, Gen. William Campbell (qv.), is buried here. Two weekly papers are edited by Sherwood Anderson's (qv) son Robert. First settled in 1750, Marion became a town in 1832. Three miles north is Hungry Mother State Park, Pop. (1940) 5,177.

MARIONETTES. See Pupper Shows.

MARIOTTE, Edme, ed-me ma-re-ot,
French physicist: d. 12 May 1684. He lived for
the most part at Dijon, and was made prior of
Saint-Martin-sous-Beaune. He became a member of the Academy of Sciences upon its formation, and was one of the founders of experimental physics. "It is Mariotte," said Condorcet, "who first in France introduced into
physics a spirit of observation and of doubt."
He discovered independently the law known by
his name—also discovered by Robert Boyle
(q.v.) and known as Boyle's law,—that if the
temperature remain constant, the volume of a
gas will vary inversely as the pressure.

MARIOTTE'S LAW, in physics, the principle that the volume of a gas, under constant, that is, unchanging, temperature and pressure, varies inversely as the pressure. It is identical with Boyle's law, the latter name being applied to it in the United States and England, and the former in continental Europe See Liquefied and Compressed Gases.

MARIPOSA GROVE, a State park of 2,560 acres, situated in Mariposa County, Cal. It contains about 465 trees of the Sequoia

gigantea, some of which are thousands of years old. The largest specimen is the Grizzly Giant, with a main limb over six feet in diameter at 200 feet above the earth and a circumference of 94 feet. The tallest tree is 272 feet high, and several are over 250 feet. A roadway 9½ feet wide has been cut through the heart of one of the giants.

MARIPOSA LILY, or BUTTERFLY LILY, popular names for various species of Calochortus of the family Liliacea. The numerous species, all of which are natives of western United States and British Columbia, are characterized by coated corms; rather leafy, generally branched stems; and showy, six-segmented flowers. Almost all the species are in cultivation for ornament, some, natives of the Colorado Desert, being suited to arid conditions, others to fairly moist soils, still others to very cold localities, as species indigenous to the Sierra Nevada. All will stand extreme cold, but not alternate freezing and thawing, hence their failure under such conditions. The bulbs should be planted in late autumn in any kind of soil. After the tops have become yellow subsequent to flowering in the following year the bulbs should be taken up, divided, and kept dry until planting time. They are often grown in pots under glass.

MARIPOSAN, or YOKUT, a linguistic stock of North American Indians, which once included about 40 tribes in southern California, in the region of Tulare Lake See Yokuts

MARIQUINA, P. I., town in the province of Rizal, Luzon, eight miles northeast of Manila. It is situated at the intersection of several main highways, has shoe and leather factories and medicinal iron springs Pop. 8180

MARIS, ma'ris, Jakob, Dutch painter: b. at The Hague, 25 Aug 1837; d 8 Oct. 1899. He began his art studies at the local academy, choosing landscape as a specialty, and receiving instruction from Ströbel and Van Hove, which latter he followed on his removal to Antwerp. He studied also under Keyser, director of the Antwerp Academy. Going to Paris he came under the influence of the Barbizon school, and reached his full power as a painter of figures and landscape in combination. In 1871 he returned to his native town His brush work and use of chiaroscuro are essentially French. Among his numerous works are 'View of Schiedam'; 'View of a Town in Holland'; 'On the Sea Shore'; 'Mother and Children.' Examples of his work may be seen at the Metropolitan Museum, New York.

MARIS, Mathew, Dutch painter, brother of Jakob Maris (q.v.): b. The Hague, 1839; d. London, 22 Aug. 1917. In his youth he traveled and worked with his elder brother; in 1855 they lived in Antwerp sharing quarters with a young student named Alma-Tadema (q.v.); in 1860 the brothers studied and sketched in Germany and Switzerland; in 1870, in Paris, Mathew was enrolled in the National Guard and performed military service during the siege. Shortly after he settled in London, where he remained till his death He was a striking example of the so-called "artistic temperament"; he painted what he liked and when he liked, with the result that his works

are extremely scarce. His work is characterized by fine qualities of color and "imaginative wizardry" At sales his pictures brought very high prices; two of them fetched \$33,075 in London

don in 1906; one produced \$17,850.

WILLIAM MARIS, a younger brother, was also a painter of note (b. 1843, d The Hague, Oct 10, 1910). He received his training from his brothers and was the most truly Dutch in his artistic sympathies. A sunny optimism pervades his work, expressed in wide skies, brilliant sunshine and gay coloring.

MARITAIN, må-rē-tăn', Jacques, French philosopher b. Paris, Nov. 18, 1882. Baptized in the Protestant faith, he first came, when a student at the Sorbonne, under the influence of the professor of biology, Félix Alexandre Le Dantee, and then was weaned away from de-terminism and crass materialism by the philos-opher Henri Bergson He became a Catholic in 1906, and, after one year at Heidelberg, gave himself to the study of Thomistic philosophy. He was professor of philosophy at the Institut Catholique, Paris, visiting professor at the Institute of Medieval Studies, Toronto and at several American universities. He was in the United States at the outbreak of World War II and was one of the first French abroad to join the de Gaulle movement, which paved the way for his appointment in 1945 as French ambassador to the Vatican. His books are devoted to a to the Vatican. His books are devoted to a technical exposition of scholastic philosophy in its Thomistic form, and to an application of Thomistic principles to politics, art, education and religion. His first work, La Philosophie bergsonnienne (1914), was a criticism of Bergson's theory of intellectual intuition; in Reflexions sur l'intelligence et sa vie propre (1924), he challenged Maurice Blondel's apparent dishe challenged Maurice Blondel's apparent distrust of abstraction and speculation; in Three Reformers: Luther, Descartes, Rousseau (tr 1929), he denounced the fountainhead of modern subjectivism. The Degrees of Knowledge (tr 1937), which may be considered his main work, contrasts the modern mathematical approach to the study of nature with the ancient metaphysical approach. His *Preface to Metaphysics* (tr. 1939), comprises lectures on being and its transcendental properties viewed as the basic principle of speculative thinking. What may be called his political treatises—Things that are not Caesar's (tr. 1930), Freedom in the Modern World (tr. 1936), True Humanism (1938), to mention but a few—are inspired by the preoccupation of safeguarding the dignity and rights of man against the encroachments of the modern totalitarian conception of the state and breathe a fervent democratic spirit, while Art and Scholasticism (tr. 1930), Prayer and Intelligence (1928), and Religion and Culture (1930) as well as Education at the Cross-Roads (1943), are typical of the manner in which the author translates into life and action the fundamental tenets of his philosophy. Ransoming the Time (tr. 1941), a collection of diverse essays, deals with one essential theme: the reconciliation of human conflicts through Christian wisdom.

MARITIME COMMISSION, United States. See United States—New Federal Agencies

MARITIME LAW. Broadly speaking, the subject matter of any action over which an

Admiralty Court could take jurisdiction should be considered a topic of the Maritime Law In this definition prize cases would be included: but the right of capture and other belligerent rights on the high seas in time of war, the im-munities of neutral shipping and cargoes, contraband traffic, etc, more properly considered, are topics of International Law (q v.). However, overseas commerce being international there is little in the lex maritima which has not an international aspect. The maritime law of Great Britain and the United States is rooted in the usages and customs of merchant seafarers, shipmasters and seamen, which are of remote antiquity and have been preserved in the Code and Digest of Justiman and other compilations hereafter mentioned. The oldest repository in England of this law was the Black Book of the Admiralty, written in Norman French and dating partly from the reigns of Edward III and Richard II and partly from the reigns of Henry IV, Henry V and Henry VI, "long before any controversies arose between the Admiralty and King's courts about foreign contracts, whereof they had been in peaceable possession time out of minde" (Prynne's Animadversion on the Fourth Part of Coke's Insti-tutes, 1668). An early record of the administration of maritime law in England is found in the Domesday of Ipswich, 17 Edward I (AD. 1289). The Black Book has disappeared but an English manuscript, which was in the library of the College of Advocates at Doctors' Commons until the dispersal of the college in 1858, had in recent years done service for the lost original. The substantive sea law of the Black Book is contained mainly in a transcript of the Laws of Oleron. This last-named compilation, which takes its name from an island off the west coast of France, near Rochefort, is extant in several manuscripts. The oldest of these written in a mixture of old French and Gascon, and now in the Guildhall at London, where it was brought from the archives of Bordeaux, probably dates from the and of the 13th centers. probably dates from the end of the 13th century. The compilation is much older, no doubt; for the Laws of Wisby, by which the merchants of the Hanne towns of the Hanne towns of the Hanne towns. of the Hansa towns and other German, Scandinavian and Russian trading communities on the Baltic and North Sea regulated their conduct are mere condensations of the Laws of Oleron —and the Hanseatic League was formed in 1252.

A more complete code of sea laws than either of those mentioned is the Consolato del Mare, of uncertain age and pedigree. Grotus asserts that it was compiled at the order of the "ancient Kings of Arragon," whereas Azum and others claim it to have been the work of Pisan lawyers. Both may be right. The Consolato del Mare was evidently not compiled at one sitting; its matter is drawn from many sources, including the Roman corpus juris and the laws and customs of Italian, French and Spanish marts of commerce While not completed until the 14th century, the extant form is apparently the resultant of accretions to a nucleus dating back possibly to the 11th century. Anyhow, a lex maritima had become generally recognized in Europe toward the end of the 12th century and its distinction from the common law of England, as asserted by Prynne, who is quoted above, is testified to by an early rescript of the Black Book providing,

that "all those who doe sue any merchant, mariner or other person whatsoever at common law of the land for any thing of auntient right belonging to the maritime law . shall be fined to the king for his unlawful and vexatious suite". The extent to which the ancient compilations have maintained their authority may be estimated from the fact that a fragment of the law of Rhodes, embodied in the Digest of Justinian and transcribed into the Consolato, states as correctly as any recent textbook the modern law of jettison and general average, while the rubric de nautuo foenore (Dig 22, 2; Code 4, 33) gives the present rules on bottomry and respondentia with absolute exactness.

The principal topics of Maritime Law (see articles under separate titles) are. Affreightment, under which head may be included the law governing contracts of shipmasters to carry freight and their resulting responsibilities as common carriers; Barratry, a sea crime which is committed when a master or crew do any unlawful acts tending to their advantage and to the detriment of the owner of a vessel --mutany is an extreme form of barratry; Bill of Lading (qv; also Commercial Law and Negotiable Instruments); Bottomry a form of contract whereby, figuratively, the keel or bottom of a ship, but in reality the entire vessel, is hypothecated to secure the repayment of money loaned, or to pay for repairs done or materials or supplies furnished and necessary to enable the vessel to complete a voyage; Charter-party, a contract of affreightment whereby the owner agrees, not to carry a particular consignment, but to let the whole or part of his ship to a merchant or other person for a particular voyage; Collision, under which title the rules for the assessment and apportionment of damage resulting from careless navigation are collected; Demurrage, the money required to be paid by the charterer for a vessel in compensation to the owner for her detention beyond the time agreed to for the loading or unloading of a cargo; General Average may be defined as contributions to be made by all parties interested in a ship or her cargo to even up the losses arising in consequence of an extraordinary sacrifice - for example, the jettison of part of her cargo - as the means of preserving from destruction the vessel or the rest of the goods she carries; Marine Insurance (q.v.) is a comparatively recent development of maritime law; the first policies it is said were issued by the Florentine merchant princes of the house of Medici; Pilotage, the practice of the pilot's profession is governed by local usages peculiar to each port and by legislative acts, which, in the United States, may take the form of either Federal or State laws; Registry of vessels and the transfer of ownership or flag, practically all matters under this head being regulated by statute in each country, Salvage, a compensation due to a person through whose gratuitous exertions a vessel or its cargo had been rescued from the perils of the sea; Wharfingers, properly "wharfagers," the owners, occupiers or custodians of a wharf.

All contracts of a maritime character are cognizable by the maritime law and enforcible by the courts administering the same. In the enforcement of contractual obligations arising

out of the relations between insurer and insured or shipper and carrier or owner and charterparty, the common-law courts as well as the courts of admiralty might take jurisdiction. But in a case of bottomry, collision, general average or salvage, where the common law of the land and the law of the sea widely diverge, the jurisdiction of the maritime tribunals is paramount. Obligations ex delicto are justiciable in courts of admiralty when the wrong was committed within their territorial jurisdiction. This jurisdiction extends to the high seas, the national territorial waters where the tide ebbs and flows and other navigable water connects with and leading to tidewater. In the United States admiralty jurisdiction may extend even to navigable waters disconnected from the sea and situated entirely within a single State. The Federal District Courts exclusively have original jurisdiction in admiralty cases. Under the maritime law no more than under the common law could there be a recovery of damages for death negligently caused. Such recovery is now permitted by statutory enactment; but the limitation of owner's liability to the value of the salvage from the wreck in which the death occurred and to the freight money earned makes the statutory relief granted practically valueless. The English law on the subject is more liberal, though, where a calamitous loss occurs and the claimants are many, the total amount of damages recoverable is too small to be compensatory in any proper sense In fact, it is possible that the limitation by law and distribution by insurance of the risks incident to maritime commerce may have too thoroughly eliminated the motive of self-interest as a factor in the promotion of efficiency and safety. When a ship is lost its owner may make a profit, receiving more than its value from the insurer; similarly, the merchant may, and often does, get more from the underwriter than the value of a cargo lost; the underwriter averages his losses and, on the whole, makes a profit out of his business. The laws for the inspection of vessels, the licensing of masters and other officers, the rules of navigation and concerning lights and other signals and the statutes prescribing imprisonment and other heavy penalties for neglect to observe these laws and regulations or supply the minimum life-saving equipment do not seem to provide an incentive equal to that which would be provided by the risk of an uninsurable total loss or unlimited liability for carelessness in the operation of vessels. The statutes, moreover, have been proven deficient in many respects for instance, it appeared from the inquiry into a recent celebrated case that the inspection of hulls did not include a test of stability

The rights and duties of masters and seamen toward each other, the vessel owner, the shipper or receiver of cargo and passengers are in part regulated by usage. By far the larger part of this department of the maritime law however is statutory. The administration of ports, the issue of clearance and other papers and similar police regulations affecting shipping are, generally, in the form of prescriptions made by the highest legislative authority, though they may be the subjects of mere municipal ordinances. These regulations have become internationalized by commercial treaties on a basis

of reciprocity, foreign shipping at practically all the ports of the world sharing burdens and advantages equally with domestic vessels Domestic regulations with respect to life-saving equipment also have international scope, because no foreign vessel can leave a port without clearance and ship's papers will not be granted until the local safety rules have been complied with The International Marine Conference held at Washington in 1894 evolved a set of «Regulations for Preventing Collisions» and the first internationally uniform "Rule of the Road." Articles 15 and 16 of the convention agreed to this conference, prescribing a system of sound signals and "moderate" speed in fog or thick weather, were considered the most important and innovatory of the regulations then adopted; but shipmasters have continued to act on the principle, "when in a place of danger, get out as quickly as possible." The Seaman's Act of 1914 and the Safety at Sea Conference held in Berlin in the spring of the same year are indicative of progress, though under existing world conditions their effect has not been appreciable.

Proceedings in Admiralty Courts are quite informal. Usually they are *m rem*, that is to say, the ship or cargo or some part of either are proceeded against rather than the master or owner in person. The initiation of an action takes the form of posting a libel, ie, attaching the same to the mast or some conspicuous place on the vessel, or to that part of the cargo against which a claim is made. The attachment of a libel creates a lien which can be discharged only by the entry of a bond, or the deposit in court of adequate security, or the payment

only by the entry of a bond, of the deposition court of adequate security, or the payment of the claim See Danish Sound Dues

Bibliography.—The principal modern Codes of Maritime Law are the following: 'Belgium Code of Commerce' (Book II); Egypt, 'Code of Commerce'; France, 'Code of Commerce'; Germany, 'Mercantile Law' (Book IV); Holland, 'Commercial Code'; Portugal, 'Commercial Code,' and Spain, 'Commercial Code' Dembski, V., 'Europe and the New Sea Law' (London 1912); Duckworth, 'Encyclopædia of Marine Law' (London 1907); Parsons, 'Shipping and Admiralty' (2 vols., Boston 1869); Saunders, 'Maritime Law' (London 1901); Smith, David Wright, 'Rule of the Road at Sea' (Glasgow 1910). Consult also Kenworthy and Young, 'Freedom of the Seas' (1928); Van Doren, 'Law of Shipment' (1932).

MARITZA, mä-rēt'sā, a river of Adrianople, the ancient Hebrus, rising as the Topolnitza, near the Bulgarian frontier, in the Balkan Mountains, and flowing through eastern Rumelia, southeast to Adrianople, where it bends to the southwest and falls into the Ægean Sea by the Gulf of Enos. It is over 300 miles long and navigable to Adrianople, about 100 miles from its mouth.

MARIUS, ma'rī-ŭs, Gaius, Roman general: b. about 156 B.C., in Cereatæ, in the Volscian territory; d. Rome, 13 Jan. 86 B.C. He won his first military repute at Numantia in 134, beginning his rapid rise from the ranks; was made tribune of the people in 119; increased his political power by marrying Julius Cæsar's aunt; became prætor in 115; went to Spain in the eext year, suppressing brigandage there; and in

109 accompanied Metallus to Africa. Two years later he was chosen consul, displaced his superior officer and made a brilliant campaign His success was so great that he was elected consul four times in succession (104-101 BC.)—a proceeding counter to law and entirely unparalleled—so as to meet the invasion of Italy by the Cimbri and Teutons. He defeated the latter tribe at Aquæ Sextiæ in 102, and the Cimbri at the Raudian Fields in 101. In 100 he was again elected consul. He made the fatal mistake of plunging into party politics, allied himself with the most disreputable leaders of the popular party, and, in his envy of the rising fame of the patrician Sulla (qv), attempted to remove him from his command in the Jugurthine War. Civil war broke out in 88. Sulla was victorious. Marius fled to Africa, whence he returned to Italy on the successful rising in Rome under Cinna. The first great proscription followed and many of Marius' opponents were killed. Marius was elected consul for the seventh time for 86 BC, but died soon after he entered upon the office. Consult Beesly, 'Marius and Sulla' (1878).

MARIUS THE EPICUREAN, the chief work in fiction of Walter Pater. It is the story of a young Roman of the days of Marcus Aurelius, but in the problems and experiences of young Marius in ancient Rome, Pater has given also something of the problems and ex-periences of a young man at the end of the 19th century In the days of Marcus Aurelius the ancient world was changing into the mediæval. Another such period was the Renaissance, in which the mediaval world was changing to the modern. In our days it may be civilization may be changing to something very different from the last few hundred years. Of the first of these great changes Pater wrote in 'Marius the Epicurean) Of the second he began to give a picture in 'Gaston de Latour,' a later novel of which he wrote only the first part. To the last period, his own, Pater devoted critical rather than creative thought. 'Marius the Epicurean,' therefore, is deeply informed with ideas; in fact the very titlepage names "Sensations and Ideas." Pater became known first as a critic; in this novel he turned to express in the form of life the ideas which he had previously pre-sented as matter of thought. A good many of Pater's ideas will be found in 'Marius' the fundamental conception of Epicureanism is a restatement of the theory of life which had al-ready been presented in the conclusion of the Renaissance and had since been much and some-times severely criticised. Flavian's plans for a career in literature have much in common with the ideas of the later essay on style. The work is characteristic of its author not only by its ideas, but by its general form. After this novel Pater published several shorter pieces which he called 'Imaginary Portraits' In each of these he presented a figure which embodies some idea or positron in the philosophy of art and life, sometimes an actual character like Watteau, sometimes an ideal figure like Sebastian von Storck. He subsequently wrote several other things of the same sort which is now generally thought of as very characteristic of his art and thought. Marius the Epicurean is an earlier, longer and more fully developed imaginary portrait. Its interest is not in the story, but in the idea, or in this case in the progress of the idea. Marius grows up in the old pagan world, comes to know all the cultiva-tion and refinement of the ancient civilization, weighs the older philosophies of life and art weighs the older philosophics of the and art and finally devotes himself to the new and growing religion of Christ Like all of Pater's fiction the story is most sedulously careful of its surroundings and environment, and the pictures of life on the great old Roman family estate, the popular festival, the interview with the emperor, the lecture on rhetoric by Fronto are among his best known In fiction in general there is an especial place for those books which present adventures and experiences of the soul rather than of the man as seen in the everyday world There were a number of such at the end of the 19th century. Among the most famous of these studies of the religious life are (John Inglesant) and (Robert Elsmere) 'Marius the Epicurean' is quite as interesting as either of these to those who follow the workings of the spirit, and quite as characteristic of the time which it presents and of the time in which it was written

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MARIUT, ma-re-oot', Lake, Egypt See Mareotis

MARIVAUX, Pierre Carlet de Chamblain de, pē-ār kar-lā de sham-blan de ma-rē-vō, French dramatist and novelist: b. Paris, 4 Feb 1688; d. there, 12 Feb 1763. He lost his patrimony in the Mississippi scheme, and also a young wife to whom he was deeply attached, and took up literature as a living He was so successful that he became an Academician in 1742 or 1743 He wrote essays in periodical form, the 'Spectateur Français' having a hint of English influence in both matter and name His novels, especially the unfinished 'Vie de Marianne' and 'Paysan parvenu,' were a protest against the literary morals of contemporary fiction. But he is best known for such plays as 'Les Jeux de l'Amour et du Hasard' (1730), 'Les Fausses Confidences' (1738), 'Le Legs' (1736) and 'La Mère confidente' (1735), which are marked by a total opposition to the style and manner of Molière, by much skill in intrigue and in portraying women and by the peculiarly artificial and elaborate style, which takes its name "Marivaudage" from the author. Consult Consult Savollée, 'Marivaux inconnu' (1880); Fleury, 'Marivaux et la Marivaudage' (1881); Gossot, 'Marivaux Moraliste' (1881); Larroument, 'Marivaux, sa Vie et ses Œuvres' (1894); Deschamps, 'Marivaux' (1897).

MARJORAM, a genus of annual or perennial herbs and a few shrubs (Origanum) of the family Menthaceæ The species of which there are about 25 are mostly natives of the Mediterranean region and southwestern Asia. They have several-flowered whorls of labiate flowers arranged in spikes. Two species are widely cultivated in gardens for culinary purposes, being used fresh, dried or in decoction for flavoring soups, stews, dressings, sauces and salads. Common or pot marjoram (O. vulgure) is a hardy perennial with pink or purple flowers and highly aromatic leaves It succeeds best upon warm garden soils well exposed to the sun, and may be propagated by seeds, divisions or cuttings. Sweet marjoram (O. murjorana) is also a perennial, but is tender and conse-

quently treated as an annual, hence the popular name annual marjoram. It is usually raised from seeds sown in a hotbed or greenhouse and transplanted to ground like the above

MARK. The original Jewish name of Mark was John (Acts xii, 12, 25, xv, 37), and it is not known when he was given or assumed the second, Latin, name by which he has always been known. Of his early life nothing is posi-tively known. It cannot be said to be more than an attractive possibility that it was at the house of his mother, Mary, that Jesus met his disciples for their last supper, and that in consequence this upper room became the permanent meeting place of the Jerusalem disciples, and also that Mark was the youth who followed the crowd to the arrest of Jesus in Gethsemane. Peter later called him his "son" (1 Peter, v, 13), from which title it is commonly inferred that he began his Christian life under the influence of that apostle. The first distinct appearance of Mark in history is as an attendant of Paul and Barnabas, the latter being his cousin (Col iv, 10, not "nephew," as the Greek word has been erroneously translated). The party went from Antioch to Cyprus and thence to Perga, on the mainland of Asia, where Mark deserted, returning to Jerusalem Because he did this Paul refused to take him on his second missionary tour and a break with Barnabas resulted, after which Mark accompanied the latter to Cyprus again. A reconciliation with Paul must have later come about, since Mark is favorably spoken of in Paul's letters to the Colossians and to Philemon, as again still later in the second letter to Timothy. More uncertainty attaches to the mention of Mark in First Peter. Perhaps the most satisfactory conclusion is to take "Babylon" as designating Rome and for this and other reasons (see article PETER, EPISTLES OF) to give to this mention a still later date. On this view, after the death of Paul, Mark would have remained in Rome and have attached himself to Peter. This would be in harmony with the language of Papias who asserted a relation between the two Any further details rest on more or less uncertain tradition. The reported connection of Mark with Alexandria is in no way improbable, but whether he was a martyr there or died a nat-ural death is unknown. The tradition that he was connected with the church at Aquileia, which is the basis of the honor paid in Venice to his memory, is no more to be depended on It may have been the result of personal reminiscence that the epithet κολοβοδάκτυλος was attached to This word means stunted or mutilated in the fingers ("stub-fingered"?), but its application in Mark's case is nowhere defined, and many explanations have been proposed, such as, that his fingers were unnaturally short; or, as the Greek word would equally apply to toes, that they were shortened, perhaps causing lame-ness, or that he had mutilated himself to evade priestly service; or, finally, that the word is used figuratively to suggest the comparative brevity of his gospel and its failure to contain much that is found in Matthew and Luke. For the connection of Mark with the second Gospel and bibliography, see article MARK, GOSPEL ACCORD-

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MARK, Edward Laurens, American anatomist. b Hamlet, Chautauqua County, N Y, 30 May 1847. In 1871 he was graduated at the University of Michigan, and in 1876 took the degree of DPh. at the University of Leipzig Dr. Mark was instructor in mathematics at the University of Michigan in 1871-72 and in the following year was astronomer of the United States Northwest Boundary Survey. From 1877 to 1883 he was instructor in zoology, from 1873 to 1886 assistant professor and since 1885 Hersey professor of anatomy at Harvard University. In 1900-21 Dr. Mark also served as director of the Harvard Zoological Laboratory Since 1903 he has been director of the Bermuda Biological Station for Research. He was United States delegate to the Fourth International Zoological Congress at Cambridge, England, in 1898 He has translated from the German, O Hertwig's 'Text-Book of the Embryology of Man and Mammals' (1892); Korschelt und Heider's 'Text-Book of the Embryology of Invertebrates,' and published contributions to the Bulletin of Comparative Zoology. He edited contributions from the Zoological Laboratory, Harvard Museum of Comparative Zoology, 1884-1921. Consult Parker (ed), 'Mark Anniversary Volume' (New York 1904).

MARK, Gospel According to. Character and Purpose.—Of the four little books called "Gospels" the second is the briefest and simplest. In the most direct fashion possible salient events of the Galilean ministry of Jesus are set forth in the first two-thirds of the book, while the last third is mainly occupied with the events of the last week of Christ's life and of his death and resurrection, the second part being given with much more of detail than the first. The book might be analyzed as follows: Introductory, the ministry of John the Baptizer, the baptism and temptation of Jesus (1, 1-13). I. The early Galilean ministry of Jesus, marked both by wide attention and by increasing hostility which culminated in the charge that Jesus was in league with Satan, this part of Christ's work ending with the choice of the 12 apostles (i, 14-iii, 35). II Later ministry in Galilee and its neighborhood, introducing parabolic teaching and consisting largely of the training of the 12 (iv, 1-x, 52). III. The entry into Jerusalem and the Jerusalem teaching, mainly controversial, in the Temple (xi, 1-xii, 44). IV. The Eschatological Discourse (xiii, 1-37). V. The closing scenes, anointing at Bethany last supper agony in Gethsemane at Bethany, last supper, agony in Gethsemane, death and resurrection (xiii, 1-xvi, 20 (8?). No purpose appears except to bring the events recorded as clearly before the readers' minds as possible, so that they might know thus much, at least, of what Jesus did and said. The book manifestly is not a missionary tract with the intent to persuade the unconvinced, but rather one who is himself a disciple tells these things to his fellow-disciples for their instruction. It has often been overlooked that the author presents as himself accepting the stupendous claims of Jesus to be the supreme master of men and their destiny and his corresponding demands for their supreme allegiance. while these are carefully and sympathetically recorded, the main impression gathered from this record of the ministry of Jesus is that of a mighty, unresting, triumphant worker, who

yet evokes the intensest hostility of the religious leaders of his nation. But the primary purpose to be recognized throughout is narration.

Authorship and Sources .- No name has ever been connected with this book except that Presumably because of its brevity which might seem perhaps to involve incompleteness, this Gospel was for a long time less quoted than Matthew or Luke But as it was included in the 'Diatessaron' of Tatian it must have been in general acceptance for some time before the year 150; in fact, there is no reason to doubt that from the time of its composition wherever known it was accepted as authorita-tive. The earliest tradition which has come down to us, connecting itself with the name of Papias who was acquainted with a number of apostles and others who had seen Jesus, makes Mark the author of a narrative which embodied the reminiscences of Peter. The second Gospel answers well to this description There are many touches which imply the remembrance of an eyewitness, such as that the grass was green (vi, 29); the look of Jesus (iii, 5); or his turning to look (v, 32). The tradition that this eyewitness was Peter is confirmed by the character of many details of events in which Peter had a share or in which he would be specially interested It is not, however, to be thought that Peter was Mark's sole authority or even that the principal share of the book is due to him. It may well be held that the main source from which Mark drew his material was the common stock of apostolic reminiscence and preaching, what must at first have been an oral gospel," which presumably took a somewhat stereotyped form both in content and in language for catechetical purposes (Luke i, 4), and which may have been committed to writing before Mark used it. It has been held by some that Mark also shows knowledge of the "Logia" document (also called "Q," see article Gospels), but in our ignorance of the scope of this docu-ment Mark's knowledge of it cannot safely be asserted

Date and Place of Composition.— No date can be positively set for the composition of the Gospel according to Mark. It has been commonly dated immediately before the destruction of Jerusalem and thought to have been written at Rome. The latest conclusion of written at Rome. The latest conclusion of critics, notably of Harnack, based on his view of the early date of Luke's writings, sets the date decidedly before the year 60 and makes Jerusalem the place of original composition. There, or at Rome later, it might have been seen by Luke in its earliest form, while it is possible that additions were made to it before it was given to the world in its present form, which probably happened at Rome. (The "Latinisms" in its language are, however, no proof of relations to Rome, as they are merely such as had been everywhere in the empire adopted into the "Koine," the common Greek of the time). It has been suggested that Mark's repeated revision of his original work resulted in what may be called three editions, the first, Palestinian and used by Luke, the second, made at Alexandria (with which city tradition associates Mark in his work), and used by the author of the first Gospel, the third, our present Gospel according to Mark, having been completed and given to the world at Rome (See

article Gospels). Much of this theory, however, is undemonstrable. But it seems safe to assert that the substance of the book belongs decidedly before the year 60 and was very possibly composed in Palestine, while in its final form it is connected with Rome.

Integrity.—It is the verdict of textual criticism that the last verses of the Gospel (16 9-20) were not a part of the original work are lacking in only two manuscripts, the Vatican and the Sinaitic, but these are the most valued of all A manuscript of the Old Latin replaces these verses with another, shorter ending for the genuineness of which no one contends, and four Greek uncials, one cursive, and also manuscripts of early translations into Syriac and other languages give both endings. An Armenian manuscript gives the name Alistion as the author of the verses in question. There is, further, a notable lack of quotation of these verses by the Fathers, while several Fathers assert that in their time they were not to be found in the best copies of the Gospel On the basis of the merely textual evidence, however, the genuineness of these verses might be accepted but there is general agreement be accepted, but there is general agreement among scholars that the internal evidence is decisive against their genuineness. The vocabulary, the style, the thought of these verses are sufficiently unlike the rest of the Gospel so that the great majority of competent critics hold that they are not by Mark. Various explanations have been proposed for the abrupt close of the original text at the end of the eighth verse, as that the author might have been interrupted in some way and never finished his book as he intended, or that the last leaf was lost from the text which was the source of all our copies, and that some one (Aristion?) later attempted

and that some one (Aristion') later attempted to make good the loss, but while any of the proposed explanations may be possible, it cannot be said that any of them are probable.

Authenticity and Value.—While, as has been said, for many centuries both Matthew and Luke were more used and valued than Mark, this judgment has of late been reversed. As it is the oldest of the three Synoptics, or at any rate preserves the original traditions of the Palestinian Church in their most primitive and unmodified form, it is of the highest value as a record This value is of course enhanced by the fact of Mark's association with so many of the early leaders of the Church, and still more by the contribution which Peter, in particular, is recognized to have made to the materials employed. The modern critical estimate may be relatively unfair to the value of the other Synoptics, but is doubtless absolutely correct in its high estimate of the authenticity and value of this Gospel.

of this Gospel.

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MARK, an old English term for a money of account, and in some other countries for a coin. The English mark originated in the 12th

century and was valued at \$3 33, and the Scottish mark, or merk, of the 19th century was \$3 42. In the comage of the German Empire the mark is a coin of nearly the same value as the English shilling A mark banco used to be a money of account in Hamburg equal to 37 cents, nearly. The mark was also used as a weight in several parts of Europe, being divided into 24 carats.

MARK, Order of Saint, a Venetian order of knighthood The doge, as well as the Senate, elected knights of Saint Mark, who enjoyed a pension. Foreigners also, particularly scholars, were elected Saint Mark the Evangelist was the patron saint of the Venetian Republic.

MARK ANTONY. See Antonius, Marcus.

MARK TWAIN. See CLEMENS, SAMUEL LANGHORNE

MARKED TREE, Ark, town of Poinsett County, 40 miles northwest of Memphis, Tenn., on the Frisco Lines It is within a few miles of Saint Francis Lake and is located in a thriving lumber district. It contains lumber factories, cooperage works and a handle factory. It has also a district high school and two banks Pop. (1940) 2,685.

MARKETING. — Definition. — Marketing, as defined by the Committee on Definitions of the American Marketing Association, "includes those business activities involved in the flow of goods and services from production to consumption." Marketing, therefore, is made up on one hand of such physical activities as transporting, storing, and selling goods, and on the other hand of a series of decisions which must be reached by any organization undertaking any part of the process of moving goods from the producer to the user.

Growth of Marketing Methods.—The importance and complexity of marketing activities have increased steadily in the years since the Industrial Revolution. In a simple village economy, the shoemaker ordinarily purchased his leather and other materials from near-by producers and took orders from his neighbors for relatively simple footwear. The quality of his work was easily recognized, and protests against poor workmanship could be made easily and directly. The shoemaker himself had no difficulty in gauging in advance what kinds of shoes would be desired by his customers or the number of shoes he should make, nor did he have to entrust any part of his relationship with those customers to others.

As specialization in production has developed and the scale of manufacturing operations has increased, producers and their customers have become widely separated in space, in time, and in knowledge. The producer of automobiles in Detroit sells throughout the United States and, indeed, throughout the world. He produces not upon the order of a particular customer for a particular automobile but rather upon the basis of anticipated future sales to unknown customers. In this anticipation of future sales, he must in turn place orders for materials and component parts well in advance of his own production period. Finally, the increasing multiplicity of the

goods manufactured and used by the people of the United States, has led to a lack of intimate knowledge on the part of the buyers of the inherent qualities of those goods Millions of people buy mechanical reirigerators and other household appliances without personal understanding of how the appliances function and without the

ability to judge the workmanship

As the scope of marketing activities has broadened, the amount of effort devoted to these functions measured in employment or in dollars, has naturally multiplied. Many estimates have been made as to the proportion of the consumer's dollar absorbed by production on one hand, and by marketing on the other. These estimates differ somewhat, but there is rather general agreement that marketing activities took more than half of the consumer's dollar in the years immediately preceding the Second World War. Figures for employment in retail trade, in wholesale trade, in transportation, in the sales departments of manufacturers and producers, in the facilitating activities of advertising agencies, publishing firms, and the like, lead to the conclusion that the steady increase in the proportion of our working population engaged in marketing activities prior to the war, had reached the point where they outnumbered those engaged in manufacturing or production.

Although the role of marketing activities has expanded substantially since the Industrial Revolution, literature on the subject has developed only within the last 30 to 40 years. Many publications devoted to various aspects of marketing have been developed and authoritative information has become available to those interested in the subject. During this period, courses in marketing, and in the various subdivisions thereof, have become common in the colleges and universities. Latterly, marketing research has developed as a highly specialized activity, in which thousands of individuals and hundreds of spe-

PRINCIPAL SUBDIVISIONS OF MARKETING

cialized firms are engaged.

The early literature of marketing is full of discussions as to what should be considered marketing functions. There are such physical activities as transporting and storing merchandise. There are also the functions of making decisions on such questions as how the product should be designed; how it should be packed; what retail and wholesale channels should be used, whether advertising is advisable and, if so, how much and what kinds; what prices should be set, not only to final buyers but also to whatever intermediaries may be used, and what pricing policies should be observed in regard to such matters as quantity discounts, terms of sale, and the like.

Although there is as yet little agreement on what are properly to be included as marketing functions, it is very clear, from the standpoint of the individual businessman, that these and similar questions must be answered as part of the marketing task. As one convenient way of dealing with such questions, they may be grouped under the following heads: merchandising; channels of distribution; brand or trademark policy; sales promotion (including advertising and personal salesmanship); pricing and price policies;

control of marketing operations.

Merchandising.—This term has many meanings. To some it is synonymous with marketing; to others it is synonymous with retailing. In the

advertising world, many men use the phrase "merchandising the advertising to the salesmen" to mean "informing and making the salesmen enthusiastic about the advertising campaign being carried on by their employer" Others say: "Merchandising is getting the goods onto the dealers' shelves, distribution is getting them oft."

The meaning given to merchandising in this article is none of these, but rather "the adjustment of the merchandise produced or offered for sale to customer demand" Merchandising for the merchant means decisions and actions with regard to what goods and what quantities of them should be bought for resale Merchandising for the manufacturer means selecting the product or products to be produced, deciding on size, appearance, form, and packaging, and determining the quantities to be produced during any given time. Thus, in manufacturing, merchandising activity can be regarded either as a part of production or as a part of marketing. It is the point at which the production department and the sales department most often come together. Effective merchandising, therefore, requires the closest coordination of those two departments

The importance of advance knowledge as to the acceptance which will be accorded to a new product or to a redesigned version of an established product has given considerable impetus to a variety of methods of testing consumer reactions in advance of large-scale marketing efforts

One vital factor in the merchandising task is that of coping with fashion For some products, such as millinery and women's and misses' dresses, the merchandising task is almost entirely that of gauging fashion trends, but even automobile designers carefully study trends in the popularity of colors. Fashion is not synonymous with style. Dr Paul H. Nystrom defines style as "a characteristic or distinctive mode or method of expression, presentation, or conception in the field of art." A style is, therefore, a more or less permanent phenomenon in contrast to a fashion, which is usually temporary A style may or may not be a fashion at any given time, it becomes a fashion when it is generally accepted by the people Queen Anne is a style of furniture, but it does not happen to be a fashion because it is no longer in widespread use. Any fashion has its beginning when a relatively few people are influenced by it, its culmination when large numbers of people follow it, and its decline when it is gradually abandoned by more and more of its followers Many theories as to the psychological motivation for this fashion cycle have been formulated. Fashion, like the stock market, is essentially a manifestation of group psychology. Fundamentally, these matters are still little understood, but practical businessmen have developed methods for scrutinizing the trend of sales in their own establishments and elsewhere which somewhat reduce the hazards of handling fashion merchandise.

In the merchandising of all types of goods, whether fashion is a major element or not, experience has demonstrated the importance of paying close attention to the buying motives of the potential customers. To do this it is first necessary to determine who the potential customers for the particular product or service are. They may be a handful of large corporations

¹ Economics of Fashion, p. 3. (Ronald Press, New York 1928).

buying for use in their own manufacturing processes, or the general public buying to satisfy

some personal need or desire.

The distinction implied in the contrast between business buyers and the general public is the basis for a classification of goods and services. of great importance in marketing, as industrial goods or consumers' goods. The latter are goods or consumers' goods The latter are bought by the public for the business of living. Food and clothing are typical of iclatively perishable consumers' goods, whereas washing machines, automobiles, and dwellings are typical of so-called consumers' durable goods. Industrial goods, on the other hand, are bought by business firms for use in the production and marketing of their own output. Industrial goods range from operating supplies, such as brooms and sweeping compounds, to major machinery and equipment and even the factory building itself, and from raw materials to fuel and power.

Channels of Distribution.—To the merchant, whether a wholesaler or a retailer, the decision as to what goods to buy for resale is a principal part of merchandising To the merchant's supplier, the decision to sell to him is a part of the supplier's selection of his channels of dis-tribution. The manufacturer of consumers' goods must decide in general what types of retail stores are the best for his product. Then he must decide whether to have his own salesmen sell direct to these retailers or to sell to whole-salers for resale to the retailers If he elects to sell through wholesalers, he must decide which types of wholesalers, and he must also choose whether to sell to them direct through his own salesmen or through such intermediaries as brokers and manufacturers' agents.

Similarly, the manufacturer of industrial goods faces the question whether to use such intermediaries as mill supply firms and manufacturers' agents or, to utilize his own sales force, working out of the main factory office or, out of sales branches strategically located throughout

the country.

Policies must be formulated not only as to the types of intermediaries to be used but also as to their number. At one extreme is a policy of exclusive distribution, under which the retail or wholesale intermediary is the sole outlet for the product or service in some particular territory. Typical of this policy is the automobile industry, with each "franchised" dealer protected within a specified territory against the competition of other dealers At the other extreme is a policy of intensive distribution, characterized by efforts to secure the maximum possible number of outlets. Typical followers of this policy are the major cigarette manufacturers, who want all the outlets they can get. Between these two extremes are many policies which may be grouped under the term "selective" Under this type of policy, certain chosen outlets are on the basis of criteria important to the manufacturer, such as prestige in the community, size, ability to provide installation or repair service, and the

There are three major considerations to be taken into account in arriving at a policy in regard to the number of outlets to be sought: (1) the willingness of prospective buyers of the particular product to seek out a source of purchase;
(2) the ability of the intermediary to contribute to the effective promotion of the particular product; (3) the intermediary's willingness to make such promotional efforts if the benefits from those efforts accrue largely to him.

In addition to deciding what policies to follow concerning the channels of distribution to be used, the marketer must exert much effort and show much ingenuity in putting the policies selected into effect Much of the day-to-day work of marketing consists of seeking to make particular retail stores, or wholesale establishments, of the type selected, want to carry the product. Much of the sales promotion program must often be directed to this end. Advertising in trade and other publications, preparation of effective display and other material useful or appealing to the dealer, offering of attractive profit margins-all these are designed to supplement and reinforce the work of the salesman in inducing retailers, wholesalers, or other intermediaries to carry the product or line of products.

Brand Policy.2—A trademark is a distinctive word, emblem, symbol, or device, or a combination of these, used on goods actually sold in commerce to indicate or identify the manu-facturer or seller of the goods.³ In business terms a trademark is a short cut to the customers' memory. The picture of the little Dutch girl and the phrase "Old Dutch Cleanser" can be retained in the memory far more easily than could "cleanser produced by the Cudahy Packing Company" Through constant use on packages and in advertising, many trademarks have almost entirely eclipsed the name of the manufacturer. By actual test, dozens of persons know and use the trademarks "Vaseline" for every one who knows the Chesebrough Manufacturing Company, even though every jar describes "Vaseline" as the Chesebrough Manufacturing brand of petroleum jelly

Because of their importance as a short cut to the customer's memory, well-established trade-marks are considered to have substantial cash value. In transactions involving the sale of one business to another and in some court decisions, well-known trademarks have been valued at many millions of dollars. As might be expected a body of law and precedent has developed and is continuing to develop for the protection of property of such value The basic principle is that erty of such value. The basic principle is that ownership of a trademark is acquired by prior use (that is, the first actual user in commerce is the owner), and registration of trademarks by the United States Patent Office is provided for by the Act of March 19, 19204

Careful observance of the legal technicalities in the choice and development of a trademark is important Of equal importance from a business standpoint is the selection of a trademark which will easily become a short cut to the customer's memory-one which lends itself readily to advertising and sales promotion and has pleasant rather than unpleasant connotations

for the prospective customer.

²A brand may include a brand name, a trademark, or both The term "brand" is comprehensive, including practically all means of identification except perhaps the shape of the product and the package. The brand name is that part of the brand which may be vocalized (Paraphrased from Committee on Definitions, American Magheting Association)

⁽Paraphrased from Committee on Marketing Association)

⁸ General Information About Protection of Trademarks, pp. 1-4. (Government Printing Office, Washington 1944)

⁴ For a full discussion of the legal aspects of trademarks, see Unfair Competition, by Zechariah Chafee, Jr., (The Harvard Law Review Association, Cambridge, Mass. 1940).

The addition of a new item to the line of a manufacturer often gives rise to the question "Shall the new item carry the same trademark as the existing items?" The use of a so-called family brand assures the newcomer of benefits from some of the goodwill that may have developed. On the other hand, the promotional needs of the new item may be secured more adequately by a distinctive trademark. As an extreme illustration, the well-known trademark for Ivory soap was understandably not deemed suitable for the vegetable shortening Crisco, made by the same company.

The importance of the brand which has gained

The importance of the brand which has gained public acceptance or preference as a means of controlling sales, has led to the description of the widespread conflict between two opposing methods of marketing, as the "Battle of the

Brands."

On the one side are manufacturers of merchandise carrying brands featured in extensive magazine, newspaper, and radio advertising, often national in scope, and relying relatively little on the promotional efforts of retailers and wholesalers. With this type of brand, the retailers and wholesalers are generally little more than necessary links in the chain for making goods physically available to prospective buyers. Whatever the personal preference of the retailer, he must carry the well-known brands of cigarettes, for example, if he is to do business in tobacco products; the development of demand by the

manufacturers makes this certain. On the other side are retailers and wholesalers with their own brands of merchandise, frequently produced by manufacturers to the retailer's specifications. Such brands are often called "private" brands, although they are more accurately described as "distributor's" brands. When the corner druggist has a particular formula for cough syrup or antimosquito lotion put up under his own brand name, he is following a distributor's brand policy in a small way. But the battle is really joined when large-scale retailers, such as the great food chains, the large mail order houses, or important department stores, seek to develop wide public acceptance for a great range of products under their own brand names Because the responsibility for maintenance of quality and the development of public acceptance rests on the owner of the brand, in this case the large-scale retailer, the manufacturer is limited to producing to specifications at as low a manufacturing cost as possible The retailer, through his contact with the market, therefore, often becomes the dominant enterprise in the chain of service bringing goods to prospective buyers.

Sales Promotion.—The principal methods

Sales Promotion.—The principal methods of promoting the sale of a product, aside from the inherent qualities of the product itself and its price, are personal salesmanship and ad-

vertising.

A marketing organization handling consumer goods must decide whether it will use salesmen to sell to final consumers (e.g. the retail store salesman or the house-to-house canvasser for vacuum cleaners or hosiery), to retailers, or to wholesalers, with or without the assistance of so-called missionary salesmen,⁵ or whether it will

rely entirely on advertising Similarly, a marketing organization handling industrial goods must decide whether its sales should be promoted by salesmen, or whether it can rely on catalogues and other forms of advertising

The management of sales organizations is a field of major importance in itself. Sales management includes the selection of salesmen, their training to serve the particular needs of the firm by which they are employed, the working out of the best methods for determining their compensation, and the control of their activities. The control of salesmen's activities includes planning the number and location of customers to be solicited, possibly the laying out of the sequence in which customers are to be visited, the planning of the type of presentation to be made to prospective customers, and the appraisal of the performance of individual salesmen.

Advertising has been one of the most thoroughly studied aspects of marketing Many types of advertising media have developed: newspapers; general circulation magazines; special circulation magazines, including so-called trade magazines, editorially devoted to the interests of particular trades or types of business executives (eg purchasing agents, power plant superintendents); radio broadcasting, both local and network; billboards along highways and city streets; car cards in public transportation systems; catalogues; direct mail advertising in many forms. The motion picture has been increasingly used as an advertising medium, often for use at large gatherings of prospective customers. Exhibits of various kinds at conventions and trade gatherings have long served the same purpose.

The marketing organization seeking an effective advertising program must give close attention to the selection of the medium or combination of media best adapted to the particular market to be sought, and the particular product to be promoted. Similarly, the construction of the advertising material to be used in these media requires careful attention to the determination of the buying motives which should be emphasized most strongly and to the most compelling ways of appealing to those buying motives. The need for specialized attention to these problems has been largely responsible for the growth of the many advertising agencies which perform these functions for their clients.

Not infrequently, the characteristics of the particular market for a particular product are such that expenditures for advertising are not likely to yield much return in sales. Sound judgment on this point by marketing organizations often has an important effect on the profit and loss statement.

PRICE DETERMINATION AND PRICE POLICIES

The individual wheat farmer does not put a price on his crop. He is offered a price adjusted by conventional amounts from the current quotation on an organized exchange, and his decision is limited to whether he will hold or sell at that price Only as large numbers of farmers, millers, and speculators change their decisions as to whether to hold, sell, or buy, does the price quotation change materially Much current economic writing implies that earlier economists believed that such a condition prevailed throughout the business structure. This view may be an injustice to those earlier economists, but in any event, the plain fact is that most marketing or-

⁵ Missionary salesmen, known as "detail men" in some industries, call on customers to encourage the placing of orders. In the dental trade, for example, manufacturers employ "detail men" to call on dentists to encourage them to place orders for the manufacturers' products with dental supply houses.

ganizations do face the problem of putting a price on their product, and not merely the question of manufacturing or not manufacturing at an established market price. The greater the degree to which the product is differentiated from other products, the more attention can be centered on factors other than the prices of competitive products. Conversely, the more the product resembles competitive products in appearance and performance, the more competitive prices will govern price policies Since one of the outstanding features of our industrial derelopment has been the widespread differentiation of products, thus greatly widening the range of the consumers' choice, it follows that the problem of setting prices has tended to become more. rather than less, important to marketing manage-

In the typical situation, the pricing problem includes the establishment not only of prices to attract buyers, but also of prices to whatever successive tiers of intermediaries are included in the marketing program. It may also involve decisions as to whether special discounts are to be offered for purchases in relatively large quantities. The pricing problem often includes the decision as to whether all customers, or all customers of a particular type or class, are to be quoted the same price, or whether individual salesmen or higher officials are to be permitted to lower prices for especially vigorous bargainers, or to recognize circumstances which result in particularly low costs to the seller. Finally, the pricing problem includes decisions as to terms of sale and delivery.

The Marketing Program.—Recognition of the interrelationship of the several subdivisions of marketing described above has led experienced marketing executives to think and act in terms of a co-ordinated marketing program. Decisions on the channels to be used bear directly on the pricing problem; decisions on price are tied in-separably to the problem of the selection of channels; and both in turn directly influence decisions in regard to methods of sales promotion Successful marketing results from the effective carrying out of a well co-ordinated marketing program, in which every element supports every other element.

MARKETING INSTITUTIONS

The principal source of quantitative statistical information concerning marketing institutions is now the census of the United States. The first such census of marketing institutions was the census of distribution of 1929. A second enumeration was the census of American business of 1933; a third, the census of business of 1935. The most recent was a part of the regular 16th census of the United States in 1940, covering the census of business for the year 1939.

Basically, marketing institutions may be divided into retail institutions, wholesale institutions, and producers' marketing departments or agencies.

Retail Trade.—In 1939 there were 1,770,355 retail stores of all types in the United States. This number represented an increase from 1,587,-718 in 1935 and 1,476,365 in 1929 Retail trade remains perhaps the greatest single stronghold of the individual small businessman. There were 1,613,673 active proprietors of unincorporated businesses in the retail field in 1939. The 1,770,355 different retail stores had sales slightly in excess of \$42,000,000,000 in the same year. They employed 4,600,217 employees (not including the active proprietors of unincorporated businesses mentioned above), and their payrolls totaled approximately \$4,500,000,000

Retail stores may be classified in a number of different ways: as to the types of goods sold; as to whether or not they are operated as single stores, or as parts of a corporate chain, or as voluntary associations, as to whether they do principally a cash or credit business; as to their general level of prices and quality of merchandise carried, and the like

Numerically, the food group bulks largest when retail stores are classified according to the type of goods sold Roughly, a third of all retail stores are in this group. When eating and drinking places to the number of more than 300,000 are added, nearly half the retail stores of the country purvey food in one form or another On the average, however, stores in the food group are smaller, measured by dollar sales, than other stores, and therefore dollar volume of food sales (excluding sales of eating and

drinking places) represented only about one quarter of the total retail sales in 1939.

Filling stations, of which there were 241,258 in 1939, ranked next to food stores in number and had sales of \$2,833,495,000 Department stores, which appear as a subdivision of the general merchandise group, numbered only 4,074 but had sales of \$3,974,998,000 By definition, the department store is one which carries a relatively wide range of merchandise and has a departmentalized form of organization The census does not classify stores with sales of less than \$100,000 annually as department stores Some department stores have sales well above \$50,000,000 per year.

Retail stores may also be classified according to whether they are owned and operated by chain store organizations, by individual proprietors, or whether they are members of voluntary chains or co-operative associations. The corporate retail chain has reached its greatest development in the variety and grocery fields, although it is also important in the drug, clothing, and filling station business. Chains of the type of F. W. Woolworth Company, S S. Kresge Corporation, W. T Grant Company, and many others do a very high proportion of the total business in the variety field. In the food trade, the Great Atlantic & Pacific Tea Company, Safeway Stores Corporation, Kroger Grocery and Baking Company, and First National Stores Incorporated, carry on approximately 40 per cent of the nation's retail food business.

To meet the competition of big chain enterprises, a large number of individual stores have linked themselves with wholesalers in so-called voluntary chains which use a common name, sell many items under a common trademark, and follow a number of uniform management practices. This type of enterprise has grown to considerable importance in the food field and is found occasionally among automotive supply stores

Wholsale Trade.—The census classifies all wholesale establishments into six major types of operation groups: (1) service and limited func-tion wholesalers; (2) manufacturers' sales branches (with stocks); (3) manufacturers' sales offices (without stocks); (4) petroleum bulk stations and terminals; (5) agents and brokers; (6) assemblers (mainly farm products). These major classifications may be broken down in more detail. The first category of service and limited function wholesalers, which included 101,627 firms out of a total of 200,573 wholesale establishments in 1939, was made up of the following.

Wholesale merchants	91,323
Voluntary group wholesalers	703
Converters (textile)	631
Export merchants	586
Importers	2,158
Industrial distributors	1,471
Cash-and-carry wholesalers	1,198
Drop shippers and desk jobbers	937
Wagon distributors	2.398
Retail-co-operative warehouses	222

For the most part, wholesale merchants buy goods outright from manufacturers and suppliers and resell them to retailers or other outlets, usually granting credit and extending delivery service. Such firms may carry a broad line of merchandise or a relatively specialized and narrow line. In contrast to the services offered by wholesale merchants, the cash-and-carry wholesalers, as the name implies, require their customers to transport the merchandise themselves and to pay cash for it. Drop shippers never take possession of merchandise, but simply secure orders which the manufacturer or supplier fill direct to the customer.

Manufacturers' sales branches (with stocks), of which there were 12,977 in 1939, and manufacturers' sales offices (without stocks), of which there were 5,119 in 1939, perform different parts of the wholesale function. Sales branches or offices may be established by manufacturers for the purpose of sale or resale to wholesalers, or for sale to retailers, or for sale to final buyers, either individual consumers or industrial enterprises.

The general category of agents and brokers, of which there were 20,903 in 1939 includes the following types:

Auction companies	649 4.710
Commission merchants	2,758
Export agents	654
Import agents .	394
Manufacturers' agents (with stocks)	1,907
Manufacturers' agents (without stocks)	7,871
Selling agents	1,487
Other agents	473

These various categories reflect differences in the arrangements between manufacturers and agents or in the method of operation of wholesafe enterprises. A common characteristic which distinguishes this group from the service and limited function wholesalers is that they do not buy and resell for their own account but serve as selling or buying representatives, usually on a commission basis.

Assemblers (mainly farm products), of which there were 29,122 in 1939, include: assemblers; commission buyers; co-operative marketing associations; co-operative sales agents; cream stations; country grain elevators; and packers and

shippers.

The census of business shows in great detail the extent to which each of these types of wholesale institutions is important for different industries and for different types of products. Every producer or manufacturer finds that one of his chief problems is to decide which of these wholesale institutions or what combination of wholesale institutions will serve him best. The great

divergence in methods of operation is partly a reflection of the differences among the markets to be served and partly a reflection of individual decisions by many different business managements

In addition to the types of marketing institutions already described, there are also the marketing departments of manufacturers or producers, which are not included among the manufacturers's sales branches. Many manufacturers, notably those with limited geographical coverage or those who sell to a few large customers, have no need for sales branches and operate entirely from the factory or central office.

In addition, there are a great many marketing institutions which might be described as facilitating organizations. Advertising agencies which prepare and supervise advertising programs for their clients are prominent among these. There are also a growing number of specialized marketing research organizations which undertake to secure facts, by survey or otherwise, as to the size and character of the market for a particular product, the best type of outlets to be used, and other factors affecting marketing decisions. In a very real sense, magazines, newspapers, and radio stations are also facilitating marketing institutions because of their importance in sales promotion activities.

INTEGRATION OF MARKETING FUNCTIONS

When a single enterprise carries out all of the activities involved in moving goods to final buyers, it may be described as having integrated all of the marketing functions. An example of thoroughgoing integration, not only of marketing activities but also of production activities, is found in the petroleum industry. Many of the concerns in the petroleum industry own oil wells, pipelines and other transport facilities for moving crude oil to refineries, refineries themselves, tankers or other transportation equipment for moving the refined product to market, and wholesale and retail marketing facilities. As another example, some manufacturers of men's clothing own and operate chains of retail stores to sell their products, and the products of other manufacturers to men.

The integration of marketing functions may be complete or partial. Grocery chains, for instance, often perform what may be described as both wholesale and retail functions. They maintain large warehouses to which goods are shipped direct from manufacturers or processors in very large quantities. These large quantities are broken down at the chain warehouses into smaller quantities and shipped to the individual retail stores, usually by truck. In other words, there has been partial integration of the marketing functions but not the complete integration which would have developed if the same interests owned both the manufacturing and the chain store organization.

A different type of partial integration is found when a manufacturer or producer sets up his own sales branches with stocks of merchandise and sells from these branches to retailers. In this case, the integration has extended through the wholesale functions but has not included the retail functions. The working out of integration to the most effective degree, taking into account not only internal costs but also sales promotion factors, is an outstanding marketing problem.

New Combinations of Merchandise.-Another important problem which concerns many types of marketing institutions is the working out of new combinations of merchandise to be carried A special aspect of merchandising activity, as described above, has featured extensive experimentation in the combinations of mer-chandise carried by particular kinds of wholesale or retail institutions A notable illustration is the development of modern drugstores, many of which, starting with a relatively clear-cut line of pharmaceuticals, have expanded to include a wide range of toys, household appliances, cosmetics, tobacco products, and even some types of Most drugstores are much like oldclothing fashioned general stores or modern department stores. In the grocery chains, there was much discussion during the 1920's about the addition of meats and fresh fruits and vegetables to the line, this development is now firmly established. Filling-station chains, several of which are operated by large tire manufacturers, are tending to broaden their lines markedly, almost to the point of becoming small department stores.

During the last two or three decades there have been, however, some developments in the opposite direction—toward narrower specializa-tion. In the shoe trade, for instance, some concerns have specialized not only in men's shoes but even in men's shoes at a single price Perhaps the extreme in such specialization was the opening in a large city of a store devoted entirely

to the sale of men's neckties

The Automobile and Marketing.—During the years following the First World War, one of the most powerful influences for change in retail trade practices was the increasing use of the automobile To this cause can be traced the rising importance of large trade centers and the decline in the trade of smaller communities in rural areas-and also the movement of retail trade to outlying sections of larger cities where parking space is available With the location of the new stores of the two major mail-order companies (Sears Roebuck & Company, Montgomery Ward & Company) in outlying sections, as compared to downtown shopping areas, and the development of large food stores, commonly called supermarkets, wherever parking space can be found, it seems highly probable retail trade has not yet felt the full effects of the increased mobility of customers resulting from the use of the automobile

Marketing Costs.—As already noted, marketing costs represent somewhat more than half, perhaps between 54 per cent and 59 per cent, of the total cost of producing and distributing goods Increasing perception of this fact has caused considerable concern about the problem of high distribution costs. Two observations in regard to this problem are worth circus. regard to this problem are worth citing: (1) "Distribution costs have in part replaced production costs. Economies flowing from large-scale manufacture, and from the technical developments that it has been possible to utilize in large-scale operations, have greatly lowered the costs of producing goods; but at the same time increased marketing costs have resulted from the attempt to dispose of larger outputs in wider markets (2) The high cost of distribution, as Professor F. W. Taussig once remarked, is to a considerable extent the price of consumer freedom -freedom to make choices from a great variety of goods, both in and out of season, freedom to gratify whims; freedom to return merchandise merely because of a change of mind; freedom to enjoy all kinds of collateral services, including credit, delivery, mail orders, telephone orders, demonstrations, lectures, fashion shows, and so on."6

These observations do not, of course, imply that intensive efforts should not be made by business management and by public authorities to reduce marketing costs. Indeed, the large proportion of total costs devoted to marketing represents an opportunity and a challenge, since the general potential standard of living can be greatly affected by efforts in this direction. Overall estimates of aggregate marketing costs do not serve particularly well for this purpose is needed is detailed information as to the costs incurred by particular types of marketing institutions.

The study of marketing costs really began some 30 years ago when the Harvard Bureau of Business Research, a division of the Harvard Graduate School of Business Administration, published its first study of the operating costs of shoe retailers Since that time, the Harvard bureau and many other educational and trade institutions have published typical figures for operating costs of many retail and wholesale trades The census of business has provided additional information, and there are few wholesale and retail trades for which at least some information about typical operating costs is not available A compendium of such studies, not only for the United States but for European countries, has been published by members of the faculty of the Harvard Graduate School of Business Administration

Published material on marketing costs of manufacturers, by contrast, is very scanty and manufacturers, by contrast, is very scanty and is largely limited to a study in 1933 by the Association of National Advertisers, a study by the Twentieth Century Fund entitled *Does Distribution Cost Too Much*? and a study of some 15 industries by the Federal Trade Commission Marketing Research.—There has been a

notable increase in interest in marketing research. In a sense, any effort to secure facts or to correlate known facts in an orderly fashion in order to provide a rational basis for marketing decisions is marketing research. Over the years most successful enterprises have, therefore, been engaged in marketing research. Business firms, advertising agencies and publishers, and specialized marketing research organizations have also been developing a considerable body of specialized techniques which warrant particular attention.

As has been noted already, the marketing of most consumer goods is characterized by farflung markets, with producer and consumer

⁶ McNair, Malcolm P, Teele, Stanley, F, Mulhearn, Frances G, (with the collaboration of Dr. Juliua Hirsch) Distribution Costs, An International Digest, p 2 (Graduate School of Business Administration, George F, Baker Foundation, Harvard University Boston 1941).

⁷ An Analysis of Distribution Costs of 312 Manufacturers, Association of National Advertisers, Inc. (in collaboration with the National Association of Cost Accountants, New York 1933)

⁸ Does Distribution Cost Too Much? Twentieth Century Fund (New York 1939)

⁹ Report of the Federal Trade Commission on Distribution Methods and Costs, United States Federal Trade Commission (United States Government Printing Office, Washington, D.C. 1944).

widely separated as to time and place. Some manufacturers of industrial goods and a few small manufacturers of highly specialized consumer goods have such a small number of potential customers that information about these potential customers may be secured by a direct, complete canvass or census. But for mose sellers the number of potential customers renders it physically and financially impossible to make a complete canvass. Under these conditions, the techniques of "sampling" become important. Essentially, the use of "sampling" rests on the proposition that results obtained from studying a properly selected sample will be representative of the whole.

An important question in radio advertising is the number of listeners for particular programs. A method has been devised whereby a careful, calculated sample of people in certain cities is telephoned and asked what program is being heard From these replies the relative popularity of different programs is calculated. Critics of this method point out that the sample is com-posed only of people in cities and only of those in the income group who have telephones this is the total group with which the marketer is concerned, the kind of sample is adequate; if, on the other hand, the marketer is interested in a cross section of the entire population, there are very important segments unrepresented in such a sample. To meet this difficulty a device has been developed which is attached to the radio and records on a tape the exact times the radio is turned on and the stations to which it is tuned. The user of this device seeks to it is tuned. have it attached to radios in homes which are carefully selected to be fully representative of the entire population, taking into account such factors as geographical distribution, racial characteristics, income levels, and urban and rural differences.

The question of the popularity of particular radio broadcasts is illustrative of problems calling for continuing information. The readership of magazines (circulation is not a complete nor accurate measure of the number of actual readers) and the movement of particular brands of goods through grocery and drugstores are other illustrations of questions which receive continuing study by one means or another.

continuing study by one means of anomalian More often a marketer needs facts to help reach a specific nonrecurring decision. The problem may be the desirability of a particular change in a package, the use of a specific kind of advertisement or other promotional piece, or the determination of the size and character of a market, either nationally or in some smaller

regional unit.

For securing information on these and a host of other questions many techniques have been developed and are used. One technique is direct observation. Observers, for instance, are stationed in liquor stores to hear and record just what happens during a transaction. How does the customer ask for merchandise? In how many instances does he ask for a specific brand of merchandise? How often does he mention price first? How often is he influenced by large special displays? The salesman, knowing of the observer's presence, may not act naturally, but the behavior of the customer is likely to be significant.

A second frequently used technique is the interview. Interviews are held in homes, on subways or other public transportation, in of-

fices, and indeed wherever people can be induced to talk Usually the interviewer is guided by a carefully prepared questionnaire or series of questions which is designed to bring out the information desired and to guard against false or mistaken answers

Both the preceding methods are expensive, since they require the time of an observer or interviewer for each observation or reply. Their high cost is a major factor which has lead to the very great use of mail questionnaires. Such questionnaires have become a popular butt for jokes, and in some instances they have been so poorly constructed or handled that the results have little or no validity. A great deal of experience on the construction of questionnaires has now been accumulated, however, and it should be possible to avoid the most egregious errors. Even after careful attention to the advance construction of questionnaires, experienced marketers conduct small-scale trial runs before using a particular questionnaire on a broad scale

The careful planning of a survey in advance, including the exact definition of the information (facts or opinions) to be sought, the determination of the methods to be used in securing information, and the handling of mass data after it has been secured, is an essential to effective and low-cost marketing research. Much refinement of techniques is now in progress and those refinements will make possible more precise measurements, but the best techniques are of little value if the basic planning in terms of objectives is not carefully and skillfully done.

THE GOVERNMENT AND MARKETING

As an important part of business as a whole, marketing is, of course, affected by all federal and state legislation which deals with business activities. The present tax structure, for insurance, affects marketing decisions as much as it effects decisions about production. There are, however, a number of important pieces of legislation which are primarily concerned with marketing activities. Among these may be mentioned the Pure Food and Drug Act as amended, the Federal Trade Commission Act establishing the principal federal agency which regulates marketing activities, and the statutes providing for the registration of trademarks. Important basic state legislation includes the uniform sales acts and many laws designed to prevent fraud and misrepresentation in sales transactions.

During the last decade there has been a considerable legislative movement related to the regulation of prices. These legislative enactments are sometimes lumped together under the heading "Fair Trade Legislation." The Clayton Act, passed many years ago in conjunction with the Federal Trade Commission Act, made a start toward limiting pricing freedom by forbidding discrimination among different localities designed to eliminate competition. In the middle 1930's this limitation was extended by the so-called Robinson-Patman Act, which provided, "That it shall be unlawful for any person engaged in commerce, in the course of such commerce, either directly or indirectly to discriminate in price between purchasers of commodities of like grade and quality. . . ." This act includes a series of specific exceptions to the basic rule against discrimination, the most important of which is, "That nothing herein contained shall prevent differentials which make only due allowance for

differences in the cost of manufacture, sale, or delivery resulting from the differing methods or quantities in which such commodities are to such

purchasers sold or delivered. . . "10

A second major piece of legislation limiting pricing freedom was the Miller-Tydings Act which permitted the states to enact legislation providing for resale price maintenance. Under such state enactments, manufacturers are permitted to require wholesalers and retailers to resell their merchandise at or above prices stipulated by the manufacturer. State legislation of this nature has been generally adopted, and resale price maintenance contracts have been widely employed, especially by manufacturers of drugs, foods, and alcoholic beverages.

A companion approach to the control of selling prices is typified by the California Unfair Practices Act, which prohibits sales below cost. A number of states have adopted this type of legislation and have defined cost variously, several setting a percentage above the price paid by the retailers or wholesalers to cover the dis-

tributors' operating costs

During the Second World War, the federal government's control of marketing was very extensive, not only through the prohibition of production of certain goods, but also through rationing and direct price control. Under these conditions, marketing managements have often had to be guided much more by government regulations than by an analysis of business circumstances.

Bibliography.—The reader seeking more detailed information on marketing will find that the literature numbers hundreds of volumes and that dozens of magazines are constantly publishing articles on the subject From these many sources, a few have been selected They are classified below as to whether they are concerned with marketing generally or some important subdivision of the subject. In addition, a few of the current magazines are listed:

GENERAL Copeland, Melvin T., Principles of Merchandising (New York 1924); Maynard, H. H., Weidler, W. C., and Beckman, T. U. Principles of Marketing (New York 1932); Converse, Paul D., Elements of Marketing (New York 1935).

SPECIAL ASPECTS OF MARKETING: Weld, L. D. SPECIAL ASPECTS OF MARKETING: Weld, L. D. H., The Marketing of Farm Products (New York 1916); Todsdal, Harry R., Principles of Personal Salesmanship (Chicago 1927); Nystrom, Paul H., Economics of Fashion (New York 1928); Frederick, John H., Industrial Marketing (New York 1934); Elder, Robert F., Fundamentals of Industrial Marketing (New York 1935); Brown Lyndon O., Market Research and Analysis (New York 1937); Nixon, Howard K., Principles of Advertising (New York 1937); American Marketing Association, The Technique of Marketing Research (New York 1937); Brisco, Norris A., and Wingate. John W., Elements of Retailing Assearch (New York 1937); Brisco, Nortis A., and Wingate, John W., Elements of Retailing Merchandising (New York 1938); Finkelhor, Francis, Legal Phases of Advertising (New York 1938); Vaile, Roland S., and Canoyer, Helen G., Income and Consumption (New York 1938); Twentieth Century Fund, Does Distribution Cost Too Much? (New York 1939); Lewis, Howard T., Industrial Purchasing, Principles and Practice (Chicago 1940); Duncan, Delbert J., and Phillips, Charles F, Retailing Principles and Methods (Chicago 1941), McNair, Malcolm P., Teele, Stanley F, and Mulhearn, Frances G., Distribution Costs, An International Digest (Boston 1941); Borden, Neil H, The Economic Effects of Advertising (Chicago 1942).

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MARKETS AND RURAL ORGANIZA-TIONS, Office of. See AGRICULTURE, DEPART-MENT OF.

MARKHAM, mark'am, Albert Hastings, English admiral and Arctic explorer, cousin of Sir Clements Markham (q.v.): b. Bagnères, Nov. 11, 1841. He entered the navy in 1855, saw active service in the China seas for several years, took part in the Polar expeditions of Adams (1873) and of Nares (1875), and in the latter expedition attained what was, then the farthest north, 83° 20′ 26″. With Sir Henry Gorn-Booth he attempted to reach Franz Joseph Land in 1879, but was unsuccessful, in the next year Markham explored the Galapagos Islands. Rear admiral in 1892 and second in command of the Mediterranean Fleet in 1893, he was made a vice admiral, and later admiral. His last command was at Nore. He retired in 1906. He wrote The Cruise of the Rosaria Amongst the New Hebrides (1873); The Great Frozen Sea (1878); The Voyages and Works of John Davis (1884); A Polar Reconnaissance (1879); and Life of Sir John Franklin (1891). He died Oct. 28, 1918.

MARKHAM, SIR Clements Robert, English geographer and traveler: b. Stillingfleet, Yorkshire, July 20, 1830, d Jan. 30, 1916. He was educated at Westminster School, entered the navy in 1844, accompanied the Franklin Search Expedition of 1850 and then retired from the service. He traveled in Peru in 1852–54 and 1860–61, the second journey being 1852-54 and 1860-61, the second journey being undertaken to get cinchona seeds for planting in India, an experiment described in his Peruran Bark, Cinchona Culture in British India, 1860-1880 (1880) After spending 1865-66 in Ceylon and India, he became assistant secretary in the India Office from 1867-77, and curator of its geographical department in 1868. From 1858-87 he was secretary of the Hakluyt Central of which he became president in 1800. From 1858-87 he was secretary of the Hakluyt Society, of which he became president in 1890. From 1863-88 he was secretary of the Royal Geographical Society, and in 1893 became its president His more important works, several of which were translated into German, are Cuzco and Lima (1856); Travels in Peru and India (1862); The Arctic Navy List (1875); Lives of Columbus, John Davis, Richard Hakluyt, Lord Fairfax, Major Rennell and Sir Leopold McClintock; Quichua Dictionary (1908); The Incas of Peru (1910). He rendered distinguished service to the history of geography and discovery by editorial work of geography and discovery by editorial work for the Hakluyt and other societies. He was created Knight Commander of the Bath in 1896.

MARKHAM, Edwin, American poet: b. Oregon City, Oreg., April 23, 1852. He spent his

¹⁰ An act to amend section 2 of the act entitled "An Act to supplement existing laws against unlawful restraints and monopolies, and for other purposes," approved Oct. 15, 1914, as amended (U.S.C., title 15, sec. 13), and for other purposes.

boyhood on a ranch in central California, herding cattle and sheep, and later graduated from the California State Normal School at San José and from Santa Rosa College. He studied law, but did not practice; subsequently took up educational work and was superintendent and head master of schools in California and principal of the Observation School of the University of California in Oakland. He had for some time been an occasional contributor to some of the leading American magazines, but first gained wide reputation through the publication of his poem, The Man with the Hoe, suggested to him by Millet's picture of the same name. This first appeared in the San Francisco Exammer and was later published in a collection entitled The Man with the Hoe and Other Poems (1899). This poem, which had a wide influence and caused much discussion, is intended by the author not merely as a picture of the peasant but as "a symbol of the toiler brutalized through long ages of industrial oppression." His other publications include Lincoln and Other Poems (1901); The Poetry of Jesus (1914); California the IVonderful (1914); The Children in Bondage (1915); Remarkable IVritings of Thomas Lake Harris, 5 vols. (1918); Gates of Paradise (1920); The Ballad of the Gallows Bird. Died S. I., New York, March 7, 1940.

MARKHAM, Gervase (or Jervis), English poet and writer. b 1568?; d London, Feb 3, 1637. A soldier of fortune in the Low Countries and later a captain under the earl of Essex in Ireland, Markham is remembered as a writer on horse-breeding, agriculture and forestry. He is said to have imported the first Arab into England for stud purposes. His Poem of Poems or Syon's Muse (1595) was dedicated to Sir Philip Sidney's daughter. He_collaborated in writing two plays, and was the author of A Discourse on Horsemanshippe (1593), as well as numerous works on husbandry.

MARKHAM, William, English colonial governor in America: b. England, about 1635; d. Philadelphia, June 12, 1704 When William Penn obtained a charter for Pennsylvania, he made Markham, a first cousin of his, his deputy. Markham had all rights granted to Penn save that of convoking a legislative assembly. On Aug 3, 1681 he established a council, later chose the site for Philadelphia and conferred with Lord Baltimore as to the Maryland-Pennsylvania boundary. Penn himself arrived on Oct. 27, 1682, and Markham, whose commission accordingly lapsed, was elected to the council. In 1684-99 he was secretary to the province, in 1686 became land commissioner and in 1689 an auditor of accounts. When in 1691 the territory now constituting the State of Delaware was detached from the province, he was appointed its deputy governor, and in 1694-99, as lieutenant governor, administered both this territory and the province.

MARKHOR, mär'kôr or -koor, a remarkable goat (Capra falconers) of the mountains of Afghanistan and northwestern India, where it keeps among the highest wooded valleys, ascending and descending only as compelled to do so by the seasonal changes in the depth of the snow. It is of large size, standing about three feet tall at the shoulders, and is reddish-brown

in summer and light gray in winter. "The magnificent beard, extending in the adult males on to the chest and shoulders, and sometimes reaching nearly to the knees, is black in front reaching nearly to the kiness, as and the and gray behind; in the young bucks and the and gray behind; is confined to the chin." The horns are very different from those of other goats, rising straight up from the forehead. spreading sideways, so as to form a V when seen from in front, and spirally twisted. Specimens have measured 50 inches along the spiral keel Several distinct local varieties of mark-hor are known to the Himalayan hunters, who regard this animal as one of the most excellent objects of sport in that region of prime game animals "Unlike the ibex, which keeps to the rugged crags and steep ravines above the limits of the forest, the markhor delights in rocky forests, and although it occasionally comes out into the open glades, it seeks concealment as much as possible." Hence its hunting calls for the greatest skill as well as endurance. This goat is often captured, tamed and crossed with domestic goats; and it is believed to have had some influence in originating the Angora breed Consult Lydekker, Wild Oxen, Sheep and Goats of All Lands (1898)

MARKIEWICZ, Countess, Irish artist and revolutionist b. Lissadel, Sligo, Ireland, about 1868 A daughter of the late Sir Henry Gore-Booth, closely connected with a number of English titled families, she has been described by the Dublin bourgeoisie as the stormy petrel of Dublin life. Her husband, a Pole, was employed in the Russian consular service, and both had been prominent figures in the social life of Dublin Before the countess became involved with the Sinn Fein Party she had made a name both as an artist and an actress, and she had frequently acted in her husband's plays at the Abbey Theatre. As a young girl the countess, then Miss Constance Gore-Booth, was presented at court and spent several seasons in London, after which she went to Paris as an art student She came into prominence during the election in Northwest Manchester in 1908 as an opponent of Mr. Churchill. The Licensing Bill was then the issue and she went to Manchester to plead the cause of the barmaids. Her sister, Miss Eva Gore-Booth (qv.), a leading English suffragette, was then the secretary of the Barmaids' Political Defence League. In 1911 the countess was charged in Dublin with assaulting a policeman at the breaking-up of a Socialist meeting During the labor troubles in Dubling the labor troubles. ing the labor troubles in Dublin in 1912 she came into conflict with the police on several occasions. On the memorable Sunday at the end of August 1912 when Larkin's dramatic arrest was the prelude to wild disorder in O'Connell Street, she and her husband came upon the scene when the excitement was at its height, and as Larkin was being escorted to the police station by a body of police with drawn batons. The countess stood up on the car she was driving and led the cheers of the mob for the captured labor leader. For many months after-ward, when a large section of the Dublin working classes was in dire poverty caused by the protracted strikes, the countess was a constant attendant at Liberty Hall, the headquarters of the Transport Workers' Union. Here she was engaged in preparing and distributing meals to the impoverished wives and families of the strikers. A few weeks before the abortive revolution in April 1916 her house was raided by the police, who found a printing plant there and many documents. At the outbreak of the revolt she apparently accompanied the party who captured Saint Stephen's Green, and when the troops got the upper hand she retired with her detachment into the Royal College of Surgeons, one of the principal buildings on the green. Eventually she hoisted the "white flag" and intimated that she would surrender at noon At the appointed hour the countess marched out of the college, followed by 120 rebels walking two abreast She was dressed entirely in green, with green tunic, green hat with green feather, green putties and green shoes She marched to where the opposing force was waiting and, going to the officer in command, saluted, kissed her revolver and handed it over with her bandolier, and announced that she was ready. The men were disarmed and marched off under armed escort to the castle. For complicity in the uprising the countess was sentenced to death by a court-martial, the sentence being afterward commuted to imprisonment for life She was liberated with the other Irish prisoners in June 1917 She continued her activity in the Sinn Fein party, however, and at the general elections held in December in 1918 she was elected to Parliament, the first woman to be so honored, but she declined to serve. Thereafter she was a leader in Irish Republican circles, opposed to the Free State. She died at Dublin, 15 July 1927.

MARKING-NUT, an East Indian tree (Semecarpus anacardium) of the cashew family, having a fruit the receptacle of which is roasted and eaten The black juice of the unripe fruit serves with quicklime to make an indelible marking-ink.

MARKINGS OF ANIMALS. See Coloration, Protective.

MARKLE, John, American coal operator: b Hazelton, Pa., 15 Dec. 1858. He was graduated in the mining engineering department of Lafayette College in 1880 and in the same year was appointed general superintendent of mines of G. B. Markle and Company, his father's firm. Upon his father's death he succeeded him and was president of the G. B. Markle Company, successor to G. B. Markle and Company, and one of the largest of the «independent» companies in the anthracite coal industry and also president and chief engineer of the Jeddo Tunnel Company. He was one of the leading figures and represented the independent operators in the negotations with President Roosevelt and in the inquiry by the President's commission in connection with the anthracite coal strike of 1902. Mr. Markle was a director of the Industrial Finance Corporation, the Morris Plan Company of New York, member of the American Institute of Mining Engineers, the New York Chamber of Commerce and Franklin Institute, Philadelphia, and a trustee of Lafayette College. He died 10 July 1933.

MARKOE, Thomas Masters, American surgeon: b. Philadelphia, Pa, 1819; d. 1901. In 1836 he was graduated at Princeton and in 1841 at the New York College of Physicians and

Surgeons He was appointed to the chair of anatomy in Castleton Medical College, Vermont; in 1852-54 was professor of pathological anatomy at the medical department of the University of the City of New York. He was appointed adjunct professor of surgery at the New York College of Physicians and Surgeons in 1860; became full professor 10 years later and in 1879 was appointed to the chair of the principles of surgery He published 'Treatise on Diseases of the Bone' (1872).

MARKS' MILLS, Engagement at. On 23 April 1864, a train of 240 wagons, escorted by 1,200 infantry, 400 cavalry and five guns, all under command of Lieut-Col. F. M. Drake, 77th Ohio Infantry, left Camden, Ark, for Pine Bluff, to get supplies for General Steele's army, then co-operating with Banks' Red River expedition. At 10 AM of the 25th, when at Marks' Mills, on the Camden and Pine Bluff road, about eight miles beyond Saline River, Drake was attacked, front and rear, by General Fagan's force of 3,000 men—cavalry, mounted infantry and two batteries—and after a hard fight of more than three hours, during which Drake was severely wounded and had lost 250 in killed and wounded, the entire train, guns and the greater part of the cavalry and infantry were captured. About 300 escaped and made their way to Little Rock and Pine Bluff. Incomplete Confederate returns show a loss of 41 killed, 108 wounded and 144 missing. Fagan's entire loss was about 420. When Steele heard of the disaster he immediately abandoned the idea of joining Banks, left Camden on the night of the 26th for Little Rock, was followed by Sterling Price, had a rear-guard fight at Jenkins' Ferry on the 30th and continued his retreat to Little Rock. Consult 'Official Records' (Vol. XXXIV). E. A CARMAN

MARL, a mixture of carbonate of lime and clay in various proportions. If the lime pre-dominate the marl is called calcareous; clay marl, or argillaceous marl, has a larger proportion of clay As marl is hard or not it is called indurated or earthy. Even the more solid marls crumble soon on exposure to the atmosphere, and form a paste if dipped in water; they effervesce in acids, because of the presence of car-bonate of lime Marl occurs in masses and beds, is associated with chalk, gypsum, sand, clay or compact limestone and contains important fossil remains To the presence of carbonate of lime in its composition, marl owes its use in the manufacture of Portland cement and as a fertilizer Many natural mixtures used as manures are called marls, such as the New Jersey green sand-marls, which contain as their principal constituents clay and greenas their principal constituents can, and and usually only 1 or 2 per cent of carbonate of lime The latter use of the word is scarcely justifiable, especially as it is sometimes applied, notably in England, to substances containing no lime at all. Marl is accumulating at the present time in many lakes in the glaciated areas of our Northern States, in part as a result of the grinding up of small shells, in part as a result of the activity of algæ known as chara, which cause the deposition of lime carbonate Marl may sometimes be a direct chemical precipitate. See MINERAL PRODUCTION OF THE UNITED STATES.

MARLATT, Charles Lester, American entomologist: b. Atchison, Kan, 26 Sept 1863 In 1884 he was graduated at the Agricultural College of Manhattan, Kansas, where he remained assistant professor for two years. In 1889–94 he was assistant entomologist and since 1894 has been first assistant and assistant chief entomologist of the Bureau of Entomology of the Department of Agriculture. He made entomological investigations in Japan, China, Java, etc., for the department in 1901–02. He directed the effort to secure a national law to prevent importation of infested and diseased plants into the United States, which resulted in the Plant Quarantine Act of 20 Aug 1912 Since 1912 he has served as chairman of the Federal Horticultural Board to supervise the enforcement of the act. Martlatt has had charge of tropical and sub-tropical fruit insect investigations and of branch stations in Florida, Louisiana, California and Hawaii. In 1928 he became Chief of Plant Quarantine and Control Administration, U. S. Department of Agriculture.

MARLBORO, N. Y., town in Ulster County; alt 180 feet; on the Hudson River, 8m N. of Newburgh; on the West Shore Railroad. The region is noted for its production of small fruits, and berries Frederick W. Goudy (qv), type designer, had his workshop here, in an old mill; it burned in January 1939 and much of Goudy's work was lost. Pop. (1930) 3,627; (1940) 3,794.

MARLBOROUGH, mārl'būr-ō, Mass, city in Middlesex County, alt. 375 feet on the Boston and Maine and the New York, New Haven and Hartford railroads, 31m. W. of Boston It is a manufacturing city, and its leading manufactures and industries are shoes, paper goods, wire goods, miners' lamps, metal stampings, and paper boxes The city has a mayor and council, its water system is municipally owned There is a public library here, a museum of natural history, and a general hospital. Settled in 1657, Marlborough was incorporated as a town in 1660, and as a city in 1890. It occupies the site of a still older Indian settlement In the building used as headquarters by the G. A. R. and the American Legion is kept a bell which was taken from John Brown's engine house at Harper's Ferry in 1861 by federal soldiers from Marlborough. Just outside the town is a tavern built in 1662, burned by the Indians in 1676, and rebuilt as it now stands in 1677. Marlborough itself was attacked by the Indians in 1676, in King Philip's War, while the townsfolk were at church. The city was named after Marlborough in England. Pop. (1930) 15,587, (1940) 15,154 Consult Hudson, 'History of the Town of Marlborough, Massachusetts.'

MARLBOROUGH, märl'bur-ō, or mâl'-bur-ō, John Churchill, Duke of, English general and statesman: b. Ashe, Devonshire, 1650; d. Blenheim, 16 June 1722. At 12 he became page to the Duke of York (afterward James II), by whom at 16 he was appointed an ensign. He was present at the siege of Tangiers and soon after his return rose to the rank of captain. In 1672 he accompanied the Duke of Monmouth to assist Turenne against the Dutch. At the siege of Maestricht he distinguished himself so highly as to obtain the public thanks of the king of France. On his return to Eng-

land he was made lieutenant-colonel and his advancement was rapid. He had a regiment of dragoons presented to him and strengthened his influence at court by his marriage with Sarah Jennings, an attendant upon the princess, afterward Queen Anne. In 1682 he obtained the title of Baron of Aymouth and on the accession of James II was sent Ambassador to France and soon after his return created Baron Churchill of Sandbridge and raised to the rank of general. The same year he suppressed the rebellion of the Duke of Monmouth On the arrival of the Prince of Orange he joined him at Axminster and was rewarded by the earldom of Marlborough and the appointment of commander-in-chief of the English army in the Low Countries. The following year he served in Ireland, where he reduced Cork, Kinsale and other places. In 1691 he was suddenly dismissed from all his employments and committed to the Tower on the charge of high treason, but soon obtained his release; though it appears that the suspicions against him were not without that the suspicions against him were not without foundation. On the death of Queen Mary he was made a privy councillor and appointed governor to the young Duke of Gloucester; and in 1701 was created by King William commander-in-chief of the English forces in Holland and Ambassador Plenipotentiary to the States-General. On the accession of Queen Anne in 1702 he was created captain-general of all the forces at home and abroad and sent Plenipotentiary to The Hague. There he was also made captain-general by the States. In the campaign of the same year he drove the French out of Spanish Guelders and took Liège and other towns, for which he was created Duke of Marlborough. In 1704 he stormed the French and Bavarian lines at Donauworth, and in the same year, with Prince Eugene, gained the victory of Blenheim (13 August) over the French and Bavarians, headed by Marshal Tallard and the Elector of Bavaria. The nation testified its gratitude by voting him the manor of Woodstock and Blenheim Palace, one of the finest seats in the kingdom. In the campaign of 1707 his antagonist was the famous Duc de Vendôme, over whom he gained no advantage; and on his return he found that his popularity at court was on the decline, this being said to be due to his avarice In 1708, with Prince Eugene, he gained the battle of Oudenarde In 1709 he defeated Marshal Villars at Mal-plaquet (11 September) though at a cost ill repaid by the capture of Mons, and in 1710 with Prince Eugene gained another victory over Villars During his absence a new ministry, hostile to himself, was chosen, and on his return his command was taken from him and a prosecution commenced against him for applying the public money to private purposes went in disgust to the Low Countries in 1712, but returned a short time before the queen's death, and on the accession of George I was reinstated in the supreme military command Consult Coxe, 'Memoirs of the Duke of Marlborough' (1847-48); Alison, 'Military Life of the Duke of Marlborough' (1879); Saintsbury, 'Marlborough' (1879).

MARLBOROUGH, New Zealand, the northeastern provincial district of South Island, bounded by the sea and the provincial district of Nelson. Its extreme length is 130 miles,

breadth 60 miles; area, 4,220 square miles. The coast is deeply indented by bays and natural harbors, from which the hills rise abruptly, clothed with magnificent forests. The district is generally hilly or mountainous, with splendid scenery. The amount of arable land is restricted; in the south are the Wairau Plains, one of the finest sheep tracts in New Zealand. Mining is carried on, gold, copper and coal being found Blenheim, the capital, is connected by rail with the seaport of Picton on Queen Charlotte Sound. Pop. (1936) 18,563.

MARLIN, Texas, city and Falls County seat; alt. 383 feet; 162m NW. of Houston; on the Southern Pacific, and the Missouri Pacific railroads. It is situated in an agricultural region in which cotton is the principal product, and the ginning and compressing of cotton is the city's leading industry. Cottonseed oil is produced and shipped. Other shipments are of brick and marble, dressed poultry, and creamery products. With three hot-water artesian wells having remarkable curative properties, Marlin tands high as a health resort, and is visited by persons from all parts of the country. There are two hospitals, one of which specializes in treatment of crippled children. The city has good schools, a public library, and a courthouse. Falls County, which was organized in 1850, created from parts of Milam and Limestone counties, was named for the falls of the Brazos River, which crosses the county. Pop. (1930) 5,338; (1940) 6,542.

MARLINGSPIKE, or MARLINE SPIKE, an iron pin tapering to a point, and principally used by sailors to separate the strands of a rope in splicing or knotting. There is a bird of this name.

MARLITT, E. See John, Eugenie.

MARLOW, Okla, city in Stephens County; on a tributary of the Washita River; 29m. S. of Chickasha; on the Rock Island Railroad. Corn and watermelons are raised in the county. Pop. (1930) 3,084; (1940) 2,899.

MARLOWE, Christopher, English poet and dramatist: b 1564; d. 1593. In 1583 he took the AB degree at Bene't College, Cambridge, and in 1587 the degree of M.A. Perhaps in the same year, the first part of his 'Tamburlaine' was acted in London; and the rest of his life was spent in active connection with the theatres. His life seems to have been somewhat dissipated and the daring of his theological opinions gave color to an accusation of atheism. In 1593 he was killed in a tavern broil and was buried at Saint Nicholas, Deptford.

Numerous plays have been assigned to Marlowe, including a share in the three parts of 'Henry VI'; and he may very likely have had some part in others besides the following, which can with certainty be ascribed to him. 'The Tragedy of Dido,' of uncertain date of acting, printed 1594; 'Tamburlaine' (two parts), acted 1587-88, printed 1590; 'Dr. Faustus,' acted 1588-89, printed 1594; 'The Jew of Malta,' acted about 1590, printed 1594; 'Edward II,' acted 1591, printed 1594; 'The Massacre of Paris,' acted after 1591, printed about 1595. His 'Hero and Leander' was left incomplete at his death and was finished by George Chapman and published in 1598. Marlowe's plays attained a sudden and great popularity and

his poetic reputation is testified to by numerous tributes from his contemporaries Marlowe's dramatic activity came at a time of great emotional stir and stress. In England the ideas and ideals of the Renaissance and the Reformation had finally gained the ascendency over those of the Middle Ages. The struggle with Spain, which was just ending in the destruction of the Armada, had brought a triumphant consciousness of national greatness. From this newly-discovered England as well as from the newlydiscovered America and the rediscovered world of Greece and Rome, came countless incentives for multiform activities. In literature as in life opportunity seemed boundless, experiment and innovation easy, voyages of discovery sure of rich reward. The drama had already become in some measure an expression of this national activity, but it still a vaited the services of great literary genius After two generations of precarious struggle, the professional companies had become firmly established in the public theatres and it was already plain that the main development of the drama was henceforth to be popular and professional rather than scholarly and amateur. In comedy, indeed, the plays of Lyly and Peele had already supplied refinement and a literary flavor, but in the popular drama in the main, and in tragedy in particular, there was neither refinement nor poetry

Marlowe created English tragedy anew. He threw aside Senecan traditions and devoted himself to meeting the demands of the London theatres, but the prologue to his first play was a declaration of reform, announcing the adoption of blank verse, heroic themes and "high astounding terms. His themes were novel. and his treatment of them seems to have been dictated by a conception of tragedy formed independently of his predecessors,—the heroic struggle of a great personality doomed to in-evitable defeat. 'Tamburlaine' is hardly a tragedy at all but rather a chronicle of the hero's greatness; but in 'Dr Faustus' and 'The Jew of Malta,' heroes with ambitions as boundless and passionate as Tamburlaine's are overwhelmed in the end by the limitations that forever bound human aspiration. These plays mark the formation of the Marlowean type of tragedy, often imitated and long influential in the English drama. A protagonist distinguished by great passions and many crimes absorbs the interest of a series of scenes, brutal and sensational, full of violent action, ranting declamation, bloodshed and villainy affording oppor-tunity for elaborate theatrical spectacles and adorned by passages of profound intellectual suggestiveness and extraordinary beauty of diction and melody. 'Edward II,' the most mation and melody. 'Edward II,' the most mature of his plays, illustrates these characteristics and also testifies to his growing power both as a playwright and as a poet. The characteriza-tion is less melodramatic, more varied and more human than in the earlie plays; the structure more coherent and organized; the style less bombastic, more even and more dramatic. Shakespeare, who clearly imitated Marlowe in 'Richard III' and produced 'Richard II' in rivalry of 'Edward II' did not in these two plays surely surpass his master.

Marlowe's faults and deficiencies are apparent and they cannot all be credited to the

immaturity and experimental nature of his art The banalities that mar his noblest scenes and the absurdities that appear in every phase of his work, theatrical, dramatic or poetic, would doubtless have disappeared in the rapid development of dramatic art which the next 30 years witnessed But there are no indications that, had Marlowe's life been prolonged, he would ever have excelled in humor or the individualization of character. His achievement is, nevertheless, among the most remarkable and enduring of the Elizabethan era His poetry remains forever impressive with its fine impetuosity, its splendors of diction and melody. His tragedies, of immense influence on the theatre of his day, continue to rank among the greatest of English literature in their expression of passionate ambition and aspiration. He was the first great English dramatist, and he prepared the way for Shakespeare. See Faust, Dr; Jew of Malta, The

Bibliography.— The best collected editions of his works are by Rev. Alexander Dyce (1850 and 1870), and by A H Bullen (3 vols., 1885). His four tragedies are in one volume of Mermaid Series of Old Dramatists with introduction by J. A. Symonds For biography and criticism: Ward, A. W., 'History of Dramatic Literature' (Vol. I); Fleay, F. G, 'Biographical Chronicle of the Drama' (Vol II); Ingram, J. H., 'Christopher Marlowe and His Associates'; Fischer, O, 'Zur Charakteristik der Dramen Marlowe's (Munich). Marlowe's life has been the theme of two modern tragedies, R. H. Horne's 'The Death of Marlowe' (1870), and Miss Josephine Peabody's 'Marlowe' (1901).

Ashley H. Thorndike, Professor Emeritus of English, Columbia Univ-

MARLOWE, Julia (MRS SOTHERN), American actress: b. (Sarah Frances Frost), Caldbeck, Cumberlandshire, England, 17 Aug. 1870. She came with her parents to the United States in 1875. In 1882 she joined the Juvemle Opera Company, which presented 'Pinafore,' The Chimes of Normandy' and other light operas, in which she was known as Frances Brough. Subsequently she took a child's part in 'Rip Van Winkle.' She then retired, studied in New York for three years and then made her metropolitan début as Parthenia in 'Ingomar.' Her later rôles include Viola in 'Twelfth Night'; Rosalind in 'As You Like It'; Highland Mary in 'For Bonnie Prince Charley' (1897); Barbara Frietchie in the play of that name by Clyde Fitch (1899), and Charlotte Durand in Cable's 'Cavalier' (1902). Other plays in which she has taken the title rôles are 'Colinet' and 'When Knighthood was in Flower.' On 28 May 1894 she was marned to Robert Taber, who had been her leading man in her first appearance in 'Romeo and Juliet' in 1888. They starred together for a season, but owing to a disagreement were later separated and in 1900 Mrs. Taber secured a divorce. The next great success was as Barbara Frietchie in Clyde Fitch's play. In 1904 she joined E H. Sothern, and for several years they were joint stars in Shakespearean rôles. In 1911 they married, and in 1916 she practically retired from the stage. Their presentations of Shakespearean plays are reckoned as some of the best ever given in America. Consult

Strang, 'Famous Actresses of the Day in America' (Boston 1899); Browne and Austin, 'Who's Who on the Stage' (New York 1906).

MARMADUKE, John Sappington, American soldier: b Saline County, Mo, 14 March 1833; d. Jefferson City, Mo, 28 Dec 1887 He studied at Yale and Harvard and graduated from West Point in 1857, and served in the Ur-ted States army in the West At the outbreak of the Civil War he entered the service of the Confederate States and rose to the rank of major-general In 1864 he was captured and was not released until after the close of the war, when he went abroad for a time, and on his return engaged in business and also in journalism He was defeated for the governorship of Missouri in 1880, but in 1884 was elected and served until his death

MARMALADE, a jellied or gelatinous preparation made from quinces, peaches, apricots or oranges and portions of their rinds, with a mixture of sugar and spice. It is made like the ordinary jams, poured out warm into pots or jars and sold as a confection. The marmalade tree (Tucuma mammosa) is of the starapple family, producing a large egg-shaped drupe, tasting like marmalade.

MARMETTE, Joseph, Canadian novelist. b. Montmagny, Quebec, 1844; d. 1895 After receiving a good general education he determined to devote himself to literature. He wrote several historical novels dealing with the main events in French-Canadian history. These include 'Charles et Eva' (1867); 'François de Bienville' (1870); 'L'Intendant Bigot' (1872); 'Le Chevalier de Mornac' (1873), and 'Le tomahawk et l'épée' (1877).

MARMIER, Xavier, French author: b. Pontarlier, Doubs, 24 June 1809; d. Paris, 11 Oct. 1892. He engaged in journalism and later traveled extensively in Switzerland, Holland, Germany, Russia, Algeria, America and the East. In 1835 he accompanied the scientific voyage of the Research to the Arctic regions and then acquired a wide knowledge of the Scandinavian and Finnish languages and customs. In 1839 he became professor of foreign literature at Rennes and in 1841 occupied a position under the Minister of Public Instruction. In 1846 he was appointed librarian at Saint Geneviève in Paris and in 1870 was elected a member of the Academy. Among his publications are 'Histoire de l'Islande' (1838); 'Langue et Littérature Islandaises' (1838); 'Histoire de la littérature en Danemark et en Suède' (1839); 'Lettres sur la Russie, la Finlande et la Pologne' (1843); 'Du Rhin au Nil' (1846); 'Lettres sur l'Amérique' (1852): 'Voyage en Suisse' (1861); 'Voyages et Littérature' (1888), and the novels 'Les fiancés du Spitzberg' (1858); 'Gazida' (1860); 'Cimarosa' (1867); 'Les drames du cœur' (1868); 'Une grande dame russe' (1876), etc.

MARMION. Scott's 'Marmion,' published 1805, is the second of his metrical romances, and the first—after the preliminary experiment of the 'Lay of the Last Minstrel'—in which he developed the full possibilities of the form. Because of the success of the earlier poem, he was offered £1,000 for this one before he had begun to write it—a circumstance

which enabled Byron to barb his satire with the taunt.

"And think'st thou, Scott' by vain conceit perchance, On public taste to foist thy stale romance, Though Murray with his Miller may combine To yield thy muse just half a crown per line?

Like most of Scott's fiction, in prose or verse, the story of Marmon is based on the fundamental impulse to revivify the past, especially in connection with the historic associations of picturesque scenes. Hence he weaves a romance about persons, some historic and some imaginative, but always with an eye toward the climax, the account of the battle of Flodden Field. It is significant, too, that the famous scene describing the quarrel between Marmion and Douglas (canto vi) was an afterthought, due to a suggestion from one of Scott's friends that he should plan Marmion's journey from England to Edinburgh so as to introduce the Douglas castle of Tantallon. Critical opinions have varied concerning the romantic plot of this poem, and Scott himself spoke severely of his having based it in part on the crime of forgery, characteristic "of a commercial rather than a proud and warlike age" But there can be no difference of view as to the splendid movement and glow of the more stirring scenes of the story — those of the kind in which Scott's genius was always at its best—especially the account of the battle of Flodden, culminating in the death of Marmion. The work also contains some interesting personal poetry, in the epistles, addressed to different friends, which Scott prefixed to the several cantos, and (in canto v) one of his most popular narrative ballads, Lochinvar.

RAYMOND M. ALDEN.

MARMOL, José, hō-zā' mar-môl', Argentine author b. Buenos Aires, Dec. 5, 1818; d. there, Aug. 12, 1871. He was a pronounced Democrat, was banished by Rosas, led the opposition against that dictator and on its successful termination became senator and librarian of Buenos Aires. A fervent orator, Marmol is better known as the author of La Amalia (1866), a historical novel dealing with Rosas' dictatorship, of the popular patriotic poem El 25 de Mayo de 1843, and of the dramas El poeta (1842), El Peregrino (1846) and El Cruzado (1851). La Amalia has long been familiar to European readers through French and German translations. An English translation was published in New York in 1919.

MARMONT, Auguste Frederic Louis Viesse de, ô-gust frâ-dê-rēk lu-ē vyĕs dữ mar-môn, Duke of Ragusa and Marshal of France: b. Chatillon-sur-Seine, France, July 20, 1774; d. Venice, March 2, 1852. He entered the army as a lieutenant of infantry in his 15th year. In 1792 he changed to the artillery, and at Toulon became acquainted with Bonaparte, who chose him for his aide-de-camp. For several years after 1805 he was military and civil governor of Dalmatia, where he initiated important public works. Being called to aid in the Austrian campaign in 1809 he assisted so efficiently that Napoleon made him a marshal and governor general of the Illyrian provinces. He was again called upon in the Spanish campaign of 1811, was severely wounded at Salamanca (q.v.), and laid up for some time. In the campaign of 1813 he held the command of an army corps in Ger-

many, and fought in the battles of Lutzen, Bautzen and Dresden. In 1814 he fought affinal battle under the walls of Paris, but opposition appearing fruitless surrendered to the allies. This proceeding was one main cause of Napoleon's immediate abdication, and brought Marmont into favor with the Bourbons After the Restoration, Louis XVIII made him a peer of France, but he was compelled to withdraw from Paris by the Revolution of 1830, and his name was struck off the army list.

MARMONTEL, Jean François, zhon fränswä mar-mon-tel, French writer: b. Bort, Limousin, France, July 11, 1723; d. Abbeville, Eure, Dec. 31, 1799. He was educated for the church, but turned to letters, and became a journalist and dramatist at Paris. In 1758-59 he edited Le Mercure, and in 1763 was elected to the Academy. He wrote tragedies, including Denys le Tyran (1748) and Aristomène (1749); Contes moraux (1761, and the works of fiction Béhsavie (1767) and Les Incas (1778). His Poétique Française (1763 and Eléments de Littérature (1787) have perhaps a more permanent worth. A collected edition of his writings appeared in 1786-87. In 1771 he was appointed historiographer of France, and in 1783 was made secretary of the French Academy.

MARMORA, mär'mō-ra, or MARMARA, Sea of (anciently Propontis), an inland sea, lying between southeastern Europe and the westernmost part of Asia, communicating with the Mediterranean by the narrow strait called the Dardanelles, and with the Black Sea by the Bosporus Length from Gallipoli to the head of the Gulf of Izmid, 170 miles; greatest breadth, which is near the center, about 45 miles; average depth over 600 feet; maximum depth, 4000 feet. The gulfs of Izmid and Moudania, on the Asiatic side, are the chief indentations. The largest of several islands is Marmora, famous for its quarries of marble and alabaster, situated near its western end; at the eastern end, on the Asiatic coast, and not far from Constantinople, is a group called the Princes Islands. A current sets from the Black Sea into the Sea of Marmora, which in turn runs into the archipelago. The tides are hardly perceptible and the navigation is easy.

MARMOSET, a small American monkey of the family Hapalidae. They inhabit the Brazilian forests, possess long, nonprehensile tails, have a thick woolly fur and bear a close resemblance to squirrels in appearance and movements, having long hind legs and penciled ears. They are notable, further, for the relatively large size of the brain and the few teeth (32), likening the family more to the monkeys of the Old World than to those of the other American family (Cebidae). They are favorite pets, not only on account of their quaint prettiness, but because of their small size, their gentleness and intelligence; but they are exceedingly delicate and rarely survive a change of climate. Their food is varied. The family includes many species which fall into two divisions—the genus Hapale and the genus Midas. The former contains the typical marmosets, or ouistitis, as the French call them, of which one species (H. jacchus) has long been a familiar pet; and the latter, the silky marmosets or tamarins, which are larger and more

varied in their colors and in their ornamental tufts and crests. They also differ in their teeth and are without ring-colors on the tail. The best known species is the marikina (M. rosalia), The pinché (M. oedipus), found at the Isthmus of Panama, has bushy gray hair on the head, giving a quaint "old man" appearance.

MARMOT, a large ground squirrel of the genus Arctomys, having terrestrial habits, rather coarse fur, no cheek-pouches, short limbs and powerful digging claws. In size they vary from about 15 to 25 inches in length, the tail adding from 3 to 12 inches. Several species inhabit the northern parts of the world, in southerly climates keeping themselves mostly upon mountain heights, but farther north inhabiting lower levels, preferring open or thinly wooded plains. All dig and dwell in burrows, some species gathering into extensive colonies, the hillocks about the mouths of the burrows forming communi-ties similar to the "towns" of the prairie-dogs; while other species dwell in families far apart from one another. They feed upon herbage and grow very fat in the autumn preparatory to hibernation during the cold months, when their Their underground dormancy is complete. sleeping-chambers are warmly furnished with dry leaves and hay. The European marmot (A. Alpinus) is found in plenty of the Alpine range, equals a rabbit in size and is light brown in color. It lives immediately below the snow line, and subsists on vegetables, insects and roots. They come forth from their burrows during the month of April, and are said to be readily tamed. The bobac, another European species (A. bobac), inhabits Poland, Russia and all northern Asia. A third species is found in the Himalayan ranges; and a fourth (A. caudatus), the largest and handsomest of the family, dwells in the valleys of their southerly slopes. These little animals are of great value to the wandering natives of northern and central Asia, who utilize both their skins and flesh. America has two marmots, one of which is the suffleur or whistler of the tops of the northern Rocky Mountains, and the other the familiar Eastern woodchuck. The former takes its name from the loud eerie whistle with which it wakes the echoes of the crags about the lone pastures above timber line, where it makes its home; it was of great service to the mountain Indians. Other species or varieties occur in the southern mountains of the western states. The woodchuck or ground hog (A. monax), is a heavy, broad-headed, grizzled animal of the woods and fields, yellowish to whitish gray in color, blackish on the back and crown and chestnut on the belly; with the feet and tail brownish black. It abounds throughout the whole country east of the dry plains, and flourishes in spite of civilization, as the farmers' meadows and gardens supply it with an increased supply of good food, and mankind thins out its worst enemies, such as wildcats, foxes, weasels, the larger serpents and birds of prey; none of these save the first is much to be feared by the full-grown woodchucks, but may kill many of the young. As a result the animals have become unpleasantly numerous in some districts of the eastern states, where their depredations upon gardens and certain plantations, as of lettuce and celery, are often serious. Consult Lydekker, Royal Natural History, vol. 3

(1895); Stone and Cram, American Animals. (1902).

MARNE, marn, France, a river, the chief affluent of the Seine, rising in the plateau of Langres, flowing northwest past Châlons to Epernay, thence westward, joining the Siene at Charenton, four miles above Paris. Its length is 326 miles, 126 of which are navigable to Saint Dizier. It is connected by canals with the Rhine, the Aisne and the Seine. The Marne was the crucial fighting line of the Western Front during the Great European War, 1914-18. During a six-days battle from Sept. 5, 1914 the march of the Germans on Paris was checked along its banks. Fighting continued between the Aisne and the Marne until the Germans began their fifth drive on July 15, 1918. American troops counter-attacked, drove the German troops back across the rivers, and with the Allied troops continued the onslaughts which led to the German request for the armistice which ended the war Nov. 11, 1918. See War, European.

MARNIAN EPOCH, name given to the period known in France as the Gallic, in England the late Celtic and in Switzerland as La Tène. It extends from about 500 BC to the conquest of Gaul by Julius Caesar. It is named Marnian from the French department of the Marne where the richest deposits of the period have been found.

MAROCCO, ma-rok'o. See Morocco.

MARONITES, măr'ū-nīts, a sect of Eastern Christians, whose origin was a consequence of the Monothelite controversy. In the 7th century the opinion that Christ, though he united in himself the divine and human natures, had but one will arose among the Eastern nations. But when their last patron, the Emperor Philippicus Bardanes, was deposed and exiled in 713. the Monothelites were condemned and banished by his successor, Anastasius. The remnant of this party survived in the Maronites (no named from their founder, Maron)—a society of monks in Syria, about Mount Lebanon, which is mentioned as early as the 6th century. Another monk, John Maro, or Marum, also preached Monothelitism there in the 7th century. Regarded as rebels by the Melchites (qv.), or Christians who adhered to the opinions of the emperor, they became, in that district of Leba-non which is now called Kesrouan, a warlike mountain people, who defended their political as well as their religious independence boldly against the Mohammedans, and who even under the Turkish government, resisted the payment of a tribute, like the Druses. The political constitution of the Maronites is that of a military commonwealth. Governed by their ancient customary rights, defended from external attacks, they support themselves among the mountains by husbandry and the produce of their vineyards and mulberry trees. The revenues of all their orders of ecclesiastics are very small, but a common spirit unites them, and in simplicity of manners, temperance and hospitality they resemble the ancient Arabians. Revenge for murder is permitted among them, and as a sign of nobility they wear the green turban. Their church constitution resembles very much that of the old Greek Church. Since the 12th century they have several times submitted to the pope and joined the Roman Catholic

Church, without giving up their own peculiarities. At last Clement XII induced them to accept the decrees of the Council of Trent at a synod held in 1736 at their convent of Marhanna. After this synod their priests still retained the right to marry, after the manner of the Greek Church; and they continued to ad-minister the sacrament under both forms. The use of the Arabic language was preserved in the church service. Mass was read only in the ancient Syriac. Their head is called the patriarch of Antioch, although his residence is in the monastery of Kanobin, upon Mount Lebanon; and he gives an account every 10 years to the pope of the condition of the Maronite Church. Under him are the bishops and other clergy-men, who form seven degrees of rank. In Kes-rouan are over 200 Maronite convents and nunneries, containing in all from 20,000 to 25,000 members who profess the rule of Saint Anthony and devote themselves to agriculture and gardening. Since 1584 there has been a Maronite college established at Rome for the education and training of their clergy The Maronites supposed to number about 300,000, and these are distributed into 150 parishes throughout Syria, Palestine, Egypt and Cyprus. In consequence of recurrent sangumary conflicts between Maronites and Druses, in 1861 under pressure of the Powers Lebanon was organized into an autonomous sanjak ruled by a Christian governor appointed by and directly responsible to the Porte. During the First World War thousands of Maronites were killed by the Turks. Governed by their emirs and enjoying a certain amount of independence they form a little nation within the framework of the Republic of Lebanon (q.v.), which, as part of France's Syrian mandate, rewhich, as part of Frances Syrian mandate, remained under French jurisdiction until France withdrew her occupation army, Sept 1, 1946 Consult Bliss, F. J, Religions of Modern Syria and Palestine (1912). See Druses.

MAROONS, the name given to runaway Negro slaves in Jamaica and in some parts of South America. The name seems to be equivalent to mountaineers, being derived from Spanish, cimarron, a fugitive Negro or maroon, from kma (same as French cima), a summit or hilltop. In many cases runaway Negroes, taking to the forests and mountains, rendered themselves formidable to the colonists and sustained a long and brave resistance against the whites. When Jamaica was conquered by the English in 1655 about 1,500 slaves retreated to the mountains. They continued to harass the island till 1795, when they were finally reduced by the aid of bloodhounds. Some of them were removed to Nova Scotia, and afterward to Sierra Leone.

MAROQUIN, măr-ō-kēn'. See Morocco (leather).

MAROS, mo'rosh, river of Rumania. It rises in eastern Transylvania and flows westward for about 550 miles, joining the Theiss at Szegedin and flowing into the Danube. Its watershed is about 30,000 square miles. It is navigable to Karlsburg, about 300 miles.

MAROT, ma-rō', Clement, French poet: b. Cahors, Quercy, winter of 1495-97; d. Turin, 1544. His father was escripuain or historiographer to Anne of Brittany. He went to Paris in 1506, was educated at the university there and studied for the bar. Through his father's inter-

est, he entered the service of Francis I; and in 1519 was attached to the suite of Margaret d' Angoulême, the king's sister. In the battle of Pavia he was wounded and taken prisoner, but on his return to Paris became a member of the royal household. Imprisoned once as a Protestant heretic, and coming again into serious risk, he fled to Navarre and to Italy; returning, he had to flee finally in 1543. Being as much a free-thinker as a Calvinist, he found no shelter in Geneva, whither first he betook himself, and went to Turin, where he died. His early poems are stiff; his later ones are almost unsurpassed for ease and grace, in which qualities his only rival is La Fontaine. He wrote many rondeaux, epigrams, epistles and ballads; also the poem L'Enfer. His famous translation of the Psalms in poetry—superior to the inadequate French prose translation of the Scriptures at that time—is said to have promoted the cause of the Reformers and was sung at the court and was widely popular in the country. Consult Morley, Henry, Clement Marot, and other Studies (London 1871); Tilley, A A. Literature of the French Renaissance, vol. I (New York 1904).

MAROZIA, ma-rō'zhǐ-à, a 10th century Roman lady of infamous reputation, known for her influence in Rome and at the papal court. She was a daughter of the equally infamous Theodora, wife of the consul Theophylact, and was first married to Alberic; and after his death to Guido of Tuscany; and after the latter's death, to Hugo, King of Italy. Through the power of her family, and by her marital alliances, she exercised absolute control over Rome for several years. She deposed Pope John X in 928 and may have caused his death. Later she bestowed the papacy on her son, John XI, who was said to have been the offspring of her guilty love with Pope Sergius III. She styled herself "Senatrix" of all the Romans and "Patricia" In 932, shortly after her third marriage, she and her husband were imprisoned by her son, Alberic II. Her husband escaped, but nothing is known of her fate. See Gregorovius' History of the City of Rome in the Middle Ages.

MARQUAND, mär-kwänd', Allan, American archaeologist: b. New York, Dec. 10, 1853; d. there Sept. 24, 1924. In 1874 he was graduated at Princeton University and studied subsequently at the universities of Berlin and Johns Hopkins. In 1881-83 he was engaged as tutor and lecturer and from 1883 to 1905 was professor of archaeology and the history of art at Princeton. After 1905 he was professor of art and archaeology at the same institution. From 1890-1921 Dr. Marquand also was director of the Princeton Museum of Historic Art, and 1896-97 was professor of archaeology at the American School of Classical Studies, Rome. After 1885 he was associated Studies, Rome. After 1885 he was associated Dr. Marquand published Greek Architecture (1909); Della Robbias in America (1912); Luca Della Robbia (1914); Andrea della Robbia, 2 vols. (1922); joint author of History of Sculpture (1896-99), and archaeological articles in various journals.

MARQUAND, Henry Gurdon, American banker and philanthropist: b. New York, April 11, 1819; d. Feb. 26, 1902. He was educated in Pittsfield, Mass., and for 20 years was in the real estate business, afterward becoming a banker and acquiring an interest in various

railways and other commercial enterprises. He was a generous patron of the Metropolitan Muscum of Art, to which he gave valuable paintings, and among his other gifts are a pavilion to Bellevue Hospital and a gymnasium and a chapel to Princeton University.

MARQUAND, John Phillips, American novelist b Wilmington, Del. Nov 10, 1893 He is a descendant of distinguished New England families that include Governors Joseph and Thomas Dudley (qqv) of Massachusetts and Margaret Fuller (qv.), the transcendentalist He grew up in New York City and Rye, NY., and attended high school in Newburyport, Mass. After being graduated from Harvard University in 1915, he wrote for the Boston Evening Transcript During World War I, he was an artillery officer in France and then returned to New York as a writer on the Tribune and later for an advertising agency

In 1920 Mr. Marquand began writing fiction professionally, publishing his novels in The Ladies Home Journal and The Saturday Evening Post The novel which first brought him distinction in American letters was The Late George Apley (1937) which won the Pulitzer Prize for fiction in 1938 By that novel, as well as Wickford Point (1939) and H. M. Pulham, Esquire (1941), he became well known as an interpreter of Boston and New England characters. He depicts them as sheltered, unhappy people, unable to break the strict moral code of family tradition.

In three other novels, So Little Time (1943), Repent in Haste (1945), and B F's Daughter (1946), World War II plays an important part These later stories are not concerned with the New England scene, although they are essentially modern novels of manners See also LATE GEORGE APLEY, THE; also NOVEL—Modern (American).

MARQUESAS, or MARQUEZAS (markā'sas), MARQUISES, or MENDANA (mēnda'ña) ISLANDS, Polynesia, an island group in the South Pacific Ocean, lat. 8° to 11° S; long 138° 30' to 141° W., belonging to France since 1842 and composed of 12 islands and islets divided into two groups, the northern and southern, with a total area of 480 square miles. The largest islands are Nukahiva, or Marchand, and Hivaoa, or Dominica. They are generally high, some of their mountains rising to over 4,000 feet. The principal food productions are pulse, yam, cocoanuts, sugarcane, cotton and bamboo; hogs are also numerous. The Marquesas were discovered in 1595 by Alonza Mendaña de Neyva They were subsequently visited and described by Cook and the Forsters in 1774, when Hood's Island was added to the group. In 1797 three more were discovered by Ingraham, an American captain, and were named Washington Islands. In 1842 they acknowledged the sovereignty of France. Pop. (1941) 2,699.

MARQUETRY, mär'ket-ri (French, marqueterie), inlaid cabinetwork in which thin slices of different colored wood, sometimes of ivory, pearl, shell or metal, are inlaid on a ground usually of oak or fir, well seasoned to prevent warping. (See Buhlwork; Inlaying; Mosaic; Parquetry.) Consult Jackson, F. H., Intarsia and Marquetry (1903).

MARQUETTE, Jacques, French Jesuit

missionary and explorer: b. Laon, France, June 1, 1637; d. near site of the present Ludington, Mich, May 18, 1675. His family was of good social position in his native city. It is evident that he must have had the advantages of early education, as he entered the Jesuit College at Nancy, in 1654, with the intention of joining the society. He studied and taught. as Jesuit scholastics usually do, at Pont-à-Mou-son, Rheims, Charleville and Langres. In 1666 he was to go as a missionary priest to New France He arrived at Quebec Sept. 20, 1666. In the next month he began his preparation for life among the savages by the study of the Indian languages, at Three Rivers, under the direction of Father Druillettes who knew all the ways of missionary life. He spent two years in the wilderness, with Father Druillettes' log house as his "home," learning the forest and living as near as possible the life of lake and living, as near as possible, the life of the redmen In 1668, Father Marquette was ready to begin work among the Ottawas From Montreal, he went to Sault Sainte Marie, known Montreal, he went to Sault Sainte Marie, known as the "Soo," then marked in French records "Santa Maria" of the Algonquins. The term "Ottawa," as used by the Jesuits, included the Sioux, the Miamis, the Sacs, the Winnebagoes, Foxes, Pottawatomies, Chippewas, Beavers, Creeks, Ottawas, Hurons, Menominees and Illinois From Sault Sainte Marie, he was sent to La Pointe Mission in Lake Superior. The place La Pointe Mission in Lake Superior. The place From Sept. 14, 1669, until 1671, when the mission was given up because of the mability of the Hurons to defend themselves against the Sioux, he served and learned much. Father Marquette probably did not foresee that this phonderment meant that there would be not abandonment meant that there would be no Christian mission on Lake Superior "for over a hundred years"; as the Rev. Samuel Hedges remarks, "There can be little doubt that the Blackrobe sat in their council circle, and took part in their deliberations, which determined their flight." He says Marquette joined the Hurons in their rush to the south toward the Island of Mackinac, then Machillimackinac The little town of Saint Ignace—named in honor of the founder of the Jesuits, Saint Ignatius Loyola, on Moran Bay,—claims the honor of being the spot where Father Marquette built his chapel in 1671. Mackinac Island disputes with Saint Ignace the right of precedure, but there can be no doubt, whether a previous mission existed in Mackinac Island or not, that it was from Saint Ignace, Father Marquette set out in his search for the Mississippi,—of the existence of which traditions and rumors lived among the tribes.

The quarrels that had deflected the course of Sieur René de la Salle did not, in the end, prevent him from tracing the course of the Mississippi to the sea, and De Soto, earlier, had crossed the valley near its mouth, but it was Marquette who, having equipped himself with the Indian lore, added to such scientific knowledge as he could acquire, actually discovered the wonderful stream of the Indian legends Count Frontenac was the devoted friend of La Salle, but he could not overcome the jealousies raised by the clashing of commercial interests. It has been the fashion to accuse the Jesuits of merely mercenary motives in opposing the opening of the territory of their missions in New France to all trappers and traders. It is plain, human,—putting aside

all imputed motives,— that Jesuits like Jogues, Albourg, Druillettes and a hundred others did not lead lives of unspeakable deprivations and amazing self-sacrifice merely for temporal gain for their Society or their country. When it is known that they were French, it is at once known that they were patriots And if the Jesuits opposed the mercantile designs of the supporter of La Salle, it must be admitted, in the light of after events, that they were safeguarding the interests of their charges. The fate of Jogues and of René Goupil did not deter men like Marquette. It only made them more anxious to teach Christianity or to die. Marquette, like all the missionary priests of his Society, held that it was his duty to con-tribute to the knowledge of the world Whether it was the analysis of a dialect or the bending of a river, the Jesuit made each his duty, always remembering the motto of his Society, "To the greater glory of God" Marquette had kept in mind all the talk about the great river and the natives that dwelt upon its banks He was sent, he believed, as one who must teach all nations, and he did not disdam any knowledge that might help him to this, valuing the knowledge itself, for every Jesuit was a student both of nature and of books Joliet had started to become a Jesuit, but had, instead, become a fur trader. When he was commissioned by the governor of New France, to look for the great stream that, it was rumored, opened into the Pacific, Father Marquette, who carnestly desired it, was sent by his superiors to accompany him. On 8 Dec. 1672 Johet reached Saint Ignace under his own authorization from De Frontenac and one from Father Marquette's provincial, to claim for God and the king all the land and water they could find

When the ice broke, on 17 May 1673, Marquette and Johet set forth. Father Pierson took Father Marquette's place at the mission. Father Marquette was something of a surveyor, and his maps are yet in evidence and very valuable. Two birch canoes that could only hug the shore and not dare the open lakes, and seven men,—five voyageurs — made up the expedition. Their stores were barely sufficient, their scientific instruments were, as one can easily imagine, inadequate They were hopeful, hardy and they knew every mood of the treacherous lakes and the meanings of all the changes in the Marquette had acquired the quick weather eye and car of the Indian, and his mind was supple and well-trained; Joliet was not far behind him in wood and water craft. Still, they followed dim rumors. The most interesting of Marquette's reports is that of the second halt at the Indian village of Mascouten, on Lake Winnebago They had reached the Gumping Winnebago They had reached the "jumping off" place. Their first halt was at De Pere, the Mission Saint Francis Xavier, to which Father the Mission Saint Francis Xavier, to which Father Mission Saint Francis Xavier, to which Father Mission Saint Francis Xavier, to which Father Mission Saint Francis Xavier, to which Father Mission Saint Francis Xavier, to which Father Mission Saint Francis Xavier (Saint Francis Xavier) assigned. Marquette had been recently assigned. They reached Lake Winnebago by way of the Fox River. From Green Bay,—the Mission Saint Francis,—they went to Lake Winnebago, and, from thence, accompanied by the Indian guides, they ascended the upper Fox River and entered the Wisconsin, on 10 June 1673. After seven days of hard paddling, they entered the Mississippi on 17 June. The report of this expedition on which we must rely for information is Marquette's.— Joliet's having been lost in the

upsetting of his canoe at the La Chine Rapids. near Montreal It is included in the 'Jesuit Relations,' and quoted by John Gilmary Shea, Sparks, Parkman, Thwaites, Hedges, and all who have written of the early days of the Northwest. Dr Shea, in his 'Discovery and Exploration of the Mississippi Valley,' estimates the distance traveled by Marquette and Lolot from Sant Ignore to Cook Park (Mississippi Valley). Joliet from Saint Ignace to Green Bay (Mission Saint Francis Xavier), at 218 miles. General Wood, inspector-general United States army, makes the whole distance traveled 2,549 miles, but he omits the distance from Saint Ignace to Green Bay Marquette and Joliet explored the Mississippi for 300 miles in solitude. Marquette describes the liver at its junction with the Missouri as turbulent in the extreme Marquette was pleased by the treatment received at the first village of Illinois Indians. They met Indians who showed some traces of civilization, and at the mouth of the Aikansas, they met with great kindness from the Indians From the Illinois - believing the route to be shorter—they went, it is asserted, to a point near Chicago. By portage, at Sturgeon Bay, they saved time and strength, and from the Green Bay into the Fox River, they reached the Mission Saint Francis—having spent, from the beginning of their ascent of the newly-discovered river, on 17 July, about two months — four months, in all, of almost incessant hardship since they began their voyage on 17 May 1673. Further journeying was out of the question. Marquette and Joliet had not much strength left. A journey of nearly 3,000 miles, in birch canoes, had told on them, hardy as they were. Marquette spent 13 months at De Pere, endeavoring to regain his health. He knew well the stupendous importance of what he had done for France and for the world; but his business was with souls. While Joliet went to Montreal to report, Marquette started to found a new mission in Illinois. He left the Mission Saint Francis on 25 Oct. 1674, with 10 canoes; he arrived at the Chicago River, 4 December. The description of the carrying of the canoes through the forests gives a glimpse of the difficulties the missionary expected to en-counter. The inundations of 30 March 1675 destroyed their hovel. At Kaskasian Mar-quette's heart was filled with gratitude by the kindness he received His desire for exploration led him, while using his strength in minis-tering to the Indians, to explore Lake Michigan He grew weaker, and turned to the farther He grew weaker, and turned to the north. Through the river—now Pere Marquette—he made his homeward way. On Saturday, 18 May 1675, he died. The Ottawa—under that name were included the tribes under the Jesuits in the Lake regions—had among them several Hiskakons, to whom Marquette had been much devoted. These, going northward in the spring, raised his body, reverently prepared it according to the mode of their tribe, took it to the Mission Saint Ignace, where Fathers Nource and Pierson awaited it. On Tuesday, 9 June 1676, Marquette was buried in the centre of the chapel of Saint Ignace, a building which was destroyed by fire in 1706. In September 1877, Father Edward Jacker, pastor of Saint Ignace, discovered the grave and remains of the great and good explorer, and they rest under a monument erected by the citizens of Saint Ignace in 1882. Consult

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MARQUETTE, mar-kěť, Mich, city, resort and Marquette County seat, alt 602 feet; on the south shore of Lake Superior in the Upper Feninsula; between the Carp River on the east and Dead River on the north; 15m E. of Ishpeming; 180m. E of Green Bay, Wis; on the Duluth, South Shore and Atlantic, and Lake Superior and Ishpeming railroads; with freight steamship service to Lake ports. It has a fine harbor with a breakwater 4,500 feet long, and excellent facilities for loading steamers with the iron ore shipped from here in large quanti-Two great docks have storage capacity of 50,000 tons each, and are equipped with ore mixing compartments. Near the city are trap rock quarries. The chief industrial establishments are railroad shops, foundries, saw and planing mills, woodenware factories, plants for producing chemical by-products of wood, and manufacture of machine parts and mining equipment. The Northern State Teachers College, established in 1899, is here. The State House of Correction and Branch Prison (1885) has an appropriate the product of the contraction of the contrac unusual arts and crafts department run on an individual business basis. The Peter White Public Library, built in 1904 and named for the city's most noted pioneer, also houses the museum and library of the County Historical Society. Presque Isle Park, which was presented to the city by the Federal Government, includes Granite Point where the American flag was first raised in 1820 by Governor Lewis Cass. The French explorers found copper in this region in the 17th century. Silver and lead were mined on Presque Isle Peninsula in 1845. Iron ore was discovered in the Marquette area in 1830, 1841, and 1844, and mining began in 1846. Ore was first transported by sleigh, later by mule cars over a plank road and finally, in 1857, by rail. In 1916 production reached a peak of over four million tons. The first permanent settlement at this point was made about 1849 and called Worcester, after the Massachusetts city. In 1850 the city was renamed after Pêre Marquette (q.v.), the 17th century French Jesuit missionary to the Indians, whose explorations helped to open the Northwest Territory to settlement. It was incorporated as a village in 1859. Destroyed by fire in 1868, it was rebuilt and incorporated as a city in 1871. Diversified industries and summer tourist trade have helped to maintain the industrial stability of the city. Pop. (1930) 14,789; (1940) 15,928.

MARQUETTE RANGE. See Iron Ores—Iron Ore Districts.

MARQUETTE UNIVERSITY, Milwaukee, Wis., comprises the following schools and colleges: College of Liberal Arts; College of Business Administration; College of Engineering; College of Journalism; College of Nursing; School of Speech; Dental School; Law School; School of Medicine; Graduate School, and Summer Session. In 1938-39 there were 4,310 students, excluding 878 in the 1939 Summer Session, including both sexes. The faculty numbers 403. Endowment funds amounted to \$2,258,959, excluding Jesuit contributory service endowment of \$2,596,346; the grounds, buildings,

and equipment were valued at \$5,831,845. This Catholic university, which is conducted by members of the Jesuit order, once is baccalaureate degrees, four master's degrees, the M.D., the D.D.S., the J.D., and the Ph.D., also diplomas in Dental Hygiene and in Nursing, and in Public Health Nursing. The bers of the Jesuit order, offers 19 kinds of library comprises, besides departmental collections, the libraries of the several schools and colleges. The entire collection consists of approximately 96,000 volumes. The library receives currently 850 leading literary and scientific periodicals. Students have access to the Milwaukee Public Library, which contains over 950,000 volumes, and to the city's Public Museum, one of the largest and most complete in the United States, containing hundreds of thousands of zoological, botanical, mineralogical, and other specimens, both institutions being located within two city blocks of the University. The history of Marquette University begins with the arrival of Jesuit fathers in 1855, who two years later opened Saint Aloysius Academy In 1864 a new building known as Saint Gall's Academy was erected. In the same year a char-ter for Marquette College was obtained. In 1906 it celebrated its silver jubilee with the erection of a new building called Johnston Hall. An amended charter creating Marquette University was obtained in 1907. The Jesuit administrative officers and teachers serve the University without salary or other recompense beyond personal support. The most recent addition to the unisupport. The most recent addition to the university is Administration Hall, erected in 1938 through the gift of an anonymous donor It houses the general administrative offices. The Marquette University High School at Milwaukee is also conducted by members of the Jesuit ALBERT C. PENNEY, Director, Central Bureau of Information and Statistics, Marquette University.

MARQUEZ, José Arnaldo, hō'sā' arnal'do mar-kāth, Peruvian poet; b. Peru, about 1825; d. Lima, 15 Jan. 1881. For participation in civil wars he was several times banished in the earlier part of his career and he lived variously in Chile, Cuba and the United States. Among modern Peruvian poets Marquez takes high rank. He published 'Lost Notes' (1862); 'Flor de Abel,' etc., and in prose 'El Peru y la Espana moderna,' and 'Recuerdos de un viage à los Estados Unidos de America.' He lost his life in the defense of Lima against the Chileans.

MARQUEZ, Leonardo, Mexican soldier: b. Mexico, about 1820 In 1849 he appeared as the leader of a movement in support of Santa Anna, and under Santa Anna's last administration he had important posts in the army (1853–55). He fought against Juarez in the "Reform" War, and favored the establishment of Maximilian's empire. In October 1866 Maximilian made him a division commander, and in March 1867 sent him to Mexico City to form a cabinet and raise troops for the relief of Querétaro. But he was hemmed in by Diaz, and after Maximilian's execution resigned and went to Havana. He was frequently called "the tiger of Tacubaya," from his execution there of a large number of prisoners (11 April 1859); though he alleged the express order of Miramon as an explanation. He was exempted from the amnesty of 1870.

MARQUEZAS ISLANDS. See Marquesas Islands

MARQUIS, mar'kwis, or MARQUESS (Italian, marchese, French, marquis, German, markgraf), a title of honor next in dignity to that of duke. Marquises were not known in England till King Richard II, in the year 1385, created his great favorite, Robert Vere, the Earl of Oxford, Marquis of Dublin In 1397 the same king raised John de Beaufort, Earl of Somerset, to the rank of marquis, a dignity which he afterward refused to bear from its being an innovation. The title fell into disuse until the reign of Edward VI, who created the marquisate of Winchester in 1551. The title given a marquis in the style of the heralds is most noble and potent prince

MARQUIS, Thomas Guthrie, Canadian author b Chatham, New Brunswick, 1864 He received his education at Queen's University, Kingston; was made English master at the Stratford High School and subsequently at the Kingston Collegiate Institute Later he became principal of the Collegiate Institute at Brockville. After 1901 he devoted his entire time to hiterature In 1905 he was chief editorial writer on the Ottawa Free Press Subsequently he edited 'Canada and its Provinces' (22 vols, 1914-15) He also published 'Stories of New France' (1890); 'Stories from Canadian History' (1893); 'Marguerite de Roberval A Romance of the Days of Jacques Cartier' (1899); 'Canada's Sons on Kopje and Veldt' (1900); 'Life of Lord Roberts' (1901); 'President of the United States' (1903); 'Brock The Hero of Upper Canada' (1912); 'The War-Chief of the Ottawas' (1914); 'The Jesuits Missions' (1915). He edited the Canadian biographical collection entitled, 'The Builders of Canada' (1903). D. 1 April 1936.

MARRAKESH. See Morocco.

MARRELLA, a genus of fossil Crustacea found in the Cambrian shales of British Columbia.

MARRIAGE, History of (Latin, marito, from maritus, husband, from mas, a male). In the natural history sense marriage may be defined as a more or less durable union between male and female lasting till after the birth and rearing of offspring. In the ethical and legal sense marriage is a union between man and woman living in complete community of life for the establishment of a family. See article on the Family, History of

The Origin and Social Function of Marriage.—In the natural history sense of the word marriage may be said to exist among many of the animals below man. Pair marriage is common among the birds and some of the higher mammals. It especially characterizes the anthropoid apes, the pair marriage of the chimpanzee being monogamous and durable, probably not unlike that of primitive man. The origin of marriage is therefore to be sought in the family, rather than the origin of the family in marriage. See article on family above referred to.

The function of marriage in human society is twofold: (1) to regulate the relations between the sexes and (2) to determine the relation of the child to the community This latter function is often overlooked, but is quite as

important in any scientific consideration of marriage as the former.

Practically all forms of marriage may be found among human beings if we consider all peoples and all historical ages, although the primitive or original form of marriage seems to have been that of a simple, pairing monogamy, similar to the pair marriage which is common among the higher animals. The reasons for rejecting the hypothesis of a primitive state of promiscuity have already been given in the article on the family just cited. Whether such a form as communal or group marriage (limited promiscuity) has ever existed among any people has been much debated by anthropologists and sociologists. The nearest approach to this form of marriage is found in certain aboriginal Australian tribes, where a man who takes a wife from a certain group has sexual access to all the other women of that group, though he lives with only one of them. A similar form is to be seen in the Punaluan family of the Polynesians, the marriage of a group of brothers with a group of sisters, though this form was rare even among the Polynesians. Most anthropologists and sociologists believe that such forms of group marriage were not primitive, but were relatively late historical developments. Setting these aside as exceptional forms, the main types of marriage in the human species may be grouped under the heads of polygyny, polyandry and monogamy.

Polygyny (Greek, "many wives") —A common form of marriage in barbarism and lower civilization is the union of one man with several women, scientifically known as polygyny, but popularly called polygamy. It is possible that this form of marriage existed to some extent in primitive times, as the gorilla among anthropoid apes is said to practise it. In general, however, it presupposes a considerable accumulation of wealth and is therefore among strictly savage peoples very rarely practised. As a human institution it received its chief development in the period of barbarism, and seems to have been an accompaniment of the development of dominantly militant life and of slavery in that period of human culture. Among people who practise polygyny, therefore, the practice is largely confined to the wealthy and ruling classes, as only these can afford the luxury of having more than one wife. polygynous countries of the present rarely over 5 per cent of the families are of polygynous type. Owing to the fact that the number of males and females in any given population un-der normal conditions is relatively equal even in polygynous lands, the mass of the families are necessarily monogamic.

The causes of polygyny are complex. Beside the animal instincts of the male we must place especially the military honor of wife capture and the economic value of women (or wives) as laborers. In barbarism the outward and visible sign of a man's wealth and power is frequently the number of his wives. A contributory cause among some peoples is the high valuation set upon children, especially under the patriarchal system (q v). This seems to have been the main cause in the case of the Hebrew patriarchs

The practice of polygyny has been widespread among practically all peoples from the MARRIAGE

stage of barbarism up, though limited to the prosperous and well-to-do Where it failed of legal sanction it frequently existed in the more or less illegal form of concubinage. It is not surprising, on this account, that in many cases it has received the explicit sanction of religion as in the cases of Mohammedanism and Mormonism But among all peoples it has tended to die out with the coming of higher civilization, for the reason that it obviously involves the subjection and degradation woman, the lack of paternal care of the children and the placing of a premium upon the more brutal instincts of human nature, espe-

cially in the male

Polyandry (Greek, "many husbands").— The union of one woman with several men is a rare form of marriage found at present practically only in Tibet and among some of the mountain tribes of India, though within his-toric times it existed in Arabia. Apparently polyandry has never been a wide-spread form of marriage in the human species, as the instinctive jealousy of the male works against it; and there is no reason for supposing, as Mc-Lennan supposed, that primitively it was universal. On the contrary, it seems to exist only under such economic and social conditions as might lead to the suppression of male jealousy. Thus the difficulty of one man supporting a family has in the barren regions of Tibet led to the toleration of polyandry. In the same region there seems to be a scarcity of women, which also favors the practice of polyandry
The most common form of polyandry is the

fraternal or Tibetan form, in which a group of brothers have a common wife, the oldest brother being the head of the household and the puta-tive father of all the children. Among the Nairs of India, however, a non-fraternal form

of polyandry exists.

Monogamy (Greek, "single marriage").-Polygyny and polyandry, as we have seen, have always been exceptional forms of marriage The prevalent form of marriage among all peoples and in all ages has been some form of monogamy, the union of one man and one woman. This has been so largely by biological necessity, as under normal conditions the number of males and females in any given population is relatively equal. The instincts of man have also to some extent favored monogamy, especially the instinct of sex jealousy nomic conditions also have rarely made it possible for a man to support more than one wife and her children. Besides such biological and economic reasons for the existence of monogamy, however, it has manifest social superiorities to any other form of marriage. It is much more favorable to superior care and upbringing of children, as under monogamy both husband and wife commonly unite in the cure of the child It develops affections and emotions of a more altrustic type, and it makes the bonds of the family life more definite and strong. For these reasons monogamy favors the development of higher types of morality and of civilization generally. Its association with higher types of civilization is, therefore, not an accident. At its best, the monogamic family presents such superior unity and harmony that it is best fitted of all the forms of marriage to work in harmony with higher civilization.

The Marriage Ceremony.—Among all peoples, savage as well as civilized, legal marriage is usually accompanied by some form of ceremony which expresses the sanction of the group upon the union. This ceremony is usually of a magical or religious character, though in a few peoples it is apparently purely social. Betrothal is also, among the more advanced peoples, frequently an occasion for some sort of religious or social ceremony

The Freedom of Choice in Marriage .-Westermarck presents considerable evidence to show that among primitive peoples marriage was originally based on the mutual attraction and consent of the parties Almost always the male is the wooer The female accepts or rejects her lover, and thus plays the decisive rôle in sex selection The same phenomena of courtship also appear very generally among the animals There is no reason for supposing that different conditions existed among primitive men. The common practices of wife capture and wife purchase must be regarded as exceptional conditions developed in later stages of civilization Marriage thus began in free choice, but among many peoples passed through stages of wife capture, and of wife purchase, under the dominance of family or tribal interests, becoming only gradually in modern times again a matter of free individual choice.

Marriage by Capture and by Purchase .-Among predatory and warlike tribes marriage by capture is often common; indeed, on account of the social and military honor attached to wife capture, it sometimes comes to be the favorite form of marriage. We know of no people, however, among whom wives are regularly captured outside the tribe. Mani-festly such a social state would be practically impossible, even though wife capture was so-

cially favored.

Much more common than wife capture, but at a much later stage of cultural development, was wife purchase. This stage comes in parwas wife purchase. ticularly in early barbarism with the development of slavery and the idea of property in persons; and among most peoples it has sur-vived until higher civilization has been developed. It was particularly instrumental in developing polygyny and the patriarchal form of the family Many survivals of wife purchase exist among even relatively highly civilized peoples

Child Marriage.—Another result of wife capture and wife purchase among some peoples was the practice which we know as "child marriage," that is, the uniting in formal marriage of children under 15 years of age, usually the marriage of a girl under 15 with a much older man As a custom, child marriage is not un-known among warlike savage and barbarous tribes. It developed, especially in India, however, under the influence of the caste system and the custom of wife purchase. More than one-half of the total female population of British India are married before 15 years of age, sometimes while they are mere infants. In the western provinces of India the girl remains at home with her parents until sexual maturity is reached; but in Bengal, girls commence their married life at the age of nine years. The British government has made ineffectual attempts to check child marriage, but the practice continues, as it is supported by the higher as well as by the lower Hindu castes.

Exogamy and Endogamy.—Among practically all peoples, custom forbids the marriage of very near kin. A limited number of tribes among savage and barbarous peoples do not forbid the marriage of brothers and sisters, but all view with social disapproval sexual relations between parents and children Indeed, the larger number of uncivilized peoples not only condemn sexual relations between blood relatives, but forbid marriages between members of the same clan, or totem group. As clans may be metronymic or patronymic, this restriction prevents marriage between maternal or paternal relatives as the case may be, even to the most remote degrees of kinship, but makes it possible for a man to marry a near relative in a clan to which he does not belong, on the ground that no kinship tie exists between them. This custom forbidding marriage within the clan is known as "exogamy" It is nearly al-ways correlated with "endogamy," as respects the tribe* Thus in the clan or totemic stage of social organization, in which most of the North American Indians were at the time of their discovery, a man must take a wife outside of his clan or totem-kin group, but usually must marry within his tribe or related tribes.

The causes of such customs of exogamy and endogamy have been much debated. McLennan held that exogamy was the outgrowth of the custom of female infanticide, but there is little or no evidence in support of such a theory. Westermarck's explanation is that exogamy arises from the extension to the whole clan of the natural instinct of aversion to incest. It may be pointed out, however, that exogamy and endogamy are not customs peculiar to uncivilized peoples Similar rules are found regarding forbidden degrees of relationship among civilized peoples. While there is possibly a civilized peoples While there is possibly a natural aversion to incest, there is even more pronouncedly instinctive attraction between persons of the opposite sex who are relatively strange and unfamiliar. This leads naturally among all peoples to marrying outside of the close social group; and among the uncivilized all members of a clan are regarded practically the same as very near relatives main difference in the practice of exogamy among the uncivilized and among the civilized is that in the clan stage of social organization it is not blood relationship in our sense which counts, but the type of social organization itself.

Marriage Among the European Peoples. -Among the early Aryan peoples of Europe marriage was universally regarded, so far as we can discover, as a religious bond, since their family life was based upon ancestor worship. This early Aryan view of marriage gave way in later Rome to the view that marriage was a private contract, to be made and dissolved by the parties at their pleasure. The early Christian Church combatted this view of the marriage relation and sought to restore the view that marriage was a religious bond, which it finally did by making marriage one of the sacraments of the Church. It was forced, however, to still recognize that consent or contract was the essential means of entering the marriage relation. "Consent marriages" continued to be recognized, therefore, though they could not

be broken except through the authority of the Church. The Protestant reformers put forth the idea that marriage was a civil relation, rather than a religious bond or sacrament, to be created by the state and broken by the state. In reaction to this view the Roman Catholic Council of Trent in 1563 declared that a valid marriage could only be created by the Church and only annulled by the Church. This still remains the Roman Catholic view of marriage. The later Roman view that marriage is a private contract, to be created and broken by individuals as any other contract, has shown a tendency to revive in modern nations among many elements of their population. The present problem of the family, therefore, centres about the question of divorce and the toleration of other forms of marriage than that of permanent monogamy. (See article on FAMILY, HISTORY OF). The last three theories mentioned are evidently held alongside of one another by different elements in the populations of modern nations Which of these competing theories of marriage will become established in the moral standards of the future it is too early yet to

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MARRIAGE, The Law of. When the cave man wanted a mate he took her, and he was not very particular where he got her. His next neighbor's cave, indeed, would be the most convenient and likely place. It was a mere question of brute strength; the man of greater physical power had his way. As social evolution progressed and families were established and organized into clans, the man who preferred to gain a wife by capture had to go further afield. To have forcibly taken a woman of an allied family, or from an affiliated clan, would have brought down upon the offender the vengeance of an entire community and, against this, individual force could not prevail. Wife capture had to be practised against hostile tribes, from whose vengeance the robber would be protected by the whole of his own community. The Roman legend of the rape of the Sabine women points to a time when wife capture from unrelated and, therefore, enemy communities was a common practice Probably robber-marriages persisted, to some extent, even in the home circle, so to speak. Among a number of semi-barbarous nations marriages still take the outward form of abductions. Before the leveling influences of Russian civilization had almost completely obliterated their tribal customs, wife captures were regularly staged by the Kirghis of the steppes. The bride, mounted on a swift horse and carrying her dowry, rode furiously out of her father's camp and the bridegroom gave chase. He was expected to catch her before dark, and he always did — that was part of the comedy. The whole performance was camouflage for the pur-

^{*}The tribe being a group of related clans speaking the same language.

pose of covering up the real transaction, which was nothing else than a bargain and sale Marriage by purchase was evolved, almost inevitably, from marriage by capture, the prospective husband paid a price to the family of the prospective wife for the privilege of carrying her off. Sometimes the abduction preceded the payment of the purchase price, the latter being disguised as a fine subsequently amerced to atone the "offense" In some instances, as under the early Roman law, the woman was adopted; she came under the fatherly power of the husband and, theoretically, became his daughter. In other times and places marriage was frankly a sale In all cases the wife became the property of her husband and, at the worst, she was his drudge or slave. The tutelage, which was exercised over a woman throughout her life (even after her marriage) by the males of the family in which she was born, was intended to be protective of her honor and that of her family, as well as of her share of the patrimony of family property. An instance in point is the Levitical law, which permitted the father of a bride, put aside by her husband on charge of unchastity, to proceed against the accuser, and, the accusation being disproved, compelled the offender to explate the wrong by keeping the woman as his wife all the days of his life. The actual condition of the wife was not as hard as might be im-plied from her legal status, or lack of legal status. The injunction to obey the father is coupled with the injunction to honor the mother. In the great Oriental monarchies of antiquity marriages were undisguisedly commercial transactions; the bought wife of a citizen of Babylon, however, was the manager of her husband's house and she was habitually consulted in serious matters of business. She was conferred with even in affairs of state if her husband happened to be a public official. A free woman, though married, might occupy a public position and hold separate property. Primitive communities do not clearly distinguish between custom and law or religion and morals; but in course of time a strictly religious form of marriage might be substituted for contractual marriage in any given community. The contractual or purchase marriage itself has a tendency to become symbolical and dramatic. The pledge given by the wooer to bind the bargain might originally have been a cow (domestic animals were real money, cattle or chattels and pecunias were words of identical meaning). This was later on represented by a gift to the bride—a bracelet, jewel or other token. The "giving in marriage," ie, the consummation of the sale of the woman, would be accompanied by conventional words and gestures, dancing and music. Sometimes a wooer made payment in personal services, as Jacob tended father Laban's sheep seven years for Rachel; and in this, as in other cases without number, the marriage was a matter of mutual inclination. The bride usually received from her father a dowry or dos, which passed to the husband and remained under his control during the continuance of the conjugal relation. Among the Jews and Oriental nations in general marriages were terminable by divorce at the will of the husband Among the Romans they were terminable at the will of the wife's father or

by mutual consent of the parties. In either case the bride's dowry was returned. The remarriage of widows was not forbidden, but was disfavored Under the Babylonian law the consent of the courts had to be obtained and provision made for the care of the children and household of the deceased husband. Monogamy and polygamy often existed side by side, even in highly developed human societies. Of the two great cultural races, the Semites have given distinct legal sanction to plurality of wives Polygamy was practised by the Hebrews in the patriarchial stage, though the practice fell into abeyance in later times Aryan institutions seem to be based on monogamous marriages. For obvious reasons monogamy must be the usual state in all communities. whatever may be the law Relatively few members of a community have the power to gain or the ability to maintain more than one wife. While a man individually might capture a woman of a hostile tribe and make her his lawful wife, captives of war became slaves. Among Oriental nations the children born to free men of their slave women or "hand maid-ens" were considered legitimate and free. Among the theoretically monogamous Aryans

the opposite was the prevalent rule

The marriage by appropriation and the resulting guardianship— or, more plainly speaking, ownership—of the wife by the husband, does not comport with the sociological thesis that the institution of the patriarchate was preceded by the matriarchate as a form of family organization The practice of polyandry is rare, even among savages, and where it is observed among people of culturally higher stage it indicates degeneracy more probably than primitiveness. In Tibet polyandry is evidently an outgrowth of the group marriage - the marriage of all the daughters of one family as a group with all the sons of another family. The plural husbands of polyandrous Tibetan women are invariably brothers. A rather frequent form of primitive marriage is that where the husband is adopted into the tribe of the wife That in such case the patriarchal authority would be less pronounced than otherwise is not evident, however. The male adopted into a tribe would assume the tribal name and be on the same footing with the males born therein. Within a clan blood kinship is traced through females; but it is not necessary to presume the matriarchate as an antecedent social order to account for this. The maternity of a child is determinable with so much greater certitude than its paternity that the tracing of kinship through the mother would commend itself for its convenience. Moreover, in those clans where this method of reckoning is customary the family and tribal organization is invariably patriarchal. Practically without exception the nations which have become the leaders in culture have erected their social structure on a basis of monandrous marriages and agnatic kinship The wife is taken into the husband's gens, clan or house, and her children become members thereof and are given the family name of their father. In the matter of inheritances cognizance was usually taken only of relationship in the male line. A daughter might inherit from her father, but if she died before he did her children would take nothing by

representation; hence the importance of the dos or marriage settlement. By neither the Roman nor Teutonic rule of consanguinity was a man's sister's husband of kin to him and the suggestion of a prohibited degree of relationship between himself and a deceased wife's sister would have sounded queer to Cæsar or Cicero The Levitical law took more account of blood relationship through females and made even a man's stepmother his cognate in blood Stepbrothers and stepsisters could not intermarry, though they had no parent in common It also forbade marital communion between certain other persons whose affinity was merely legal
—as between a man and his uncle's widow or with his daughter-in-law. It forbade marriages of near relations to the third degree of blood kinship on either the maternal or paternal side—and this rule has prevailed throughout the Christian world. According to the Levitical law a man should not bring his sister-in-law into his house as a rival to his wife, but there was no prohibition with a de-ceased wife's sister and a man was expected to be a husband to the childless widow of his

brother. In the earlier period of their history the Romans recognized three kinds of formal marmage The religious form, confarreatio, or "marriage with the bread-offering," had to be solemnized by the Pontifex Maximus in the presence of 10 witnesses and was reserved to themselves by the old patrician families. Among the plebians espousals took the form of a purchase, coemptio, which is defined by Gaius as a mutual mock sale of the parties, whereby the wife was freed from tutela legitıma and sacrıs fanuliæ — tutelage to her male relatives and contributions for the maintenance of certain religious rites in her husband's household The third form, usus, though held in little respect in the earlier period, ultimately became prevalent in all social ranks. Either by confarreation or coemption the woman given in marriage passed in manum viri, literally into the hands of the man, her husband, who acquired rights over the person and property of his wife greater, on the whole, than have been, or are, conferred by any modern system of law He controlled her dos and other possessions absolutely during his life and continued his wardship after his death through guardians appointed in his will. The usus ripened into a perfect matrimonial bond only by prescription and after continued cohabitation for an entire year. In the meanwhile the husband's marital despotism was in abeyance. By simply absenting herself from the matrimonial domicile for one day in each year the usus wife could indefinitely postpone and de-feat the acquirement of tutelary and possessory rights by the husband On the other hand, the later law reduced the tutelage of the male kin over the women of their family to a mere formality. By contracting a usus marriage, therefore, the women of Rome were enabled to evade both the paternal and matrimonial tyranny, under which they had been placed by the earlier law. In fact, at the most splendid period of Rome creatests married semantics. period of Roman greatness married women enjoyed a freedom with respect to their persons and property such as they have not enjoyed anywhere since then Most important of all was the establishment of the principle that marriage rested upon the consent of the parties — concensus, non concubitas, fecit nubitas—and might, therefore, be dissolved at the pleasure of either party. While the marital union was admitted to involve a sharing of all for life—consortium omnis vitæ—this was declared to mean a voluntary, not a forced, partnership To hinder a separation when a consensus had ceased to exist was regarded contra bonos mores, in plain English, "immoral"

Early Teutonic marriage law did not differ greatly in fundamentals from that of Rome. Though disguised by ceremonials the transaction was essentially a barter. In the original and crudest form the custom was to give the father so much for his daughter, the price being fixed in accordance with the wealth and rank of the families participating in the treaty. The contract was made handfast, just like any other bargain, by a pledge or part payment. In progress of time this pledge, vadium, took the form of an ornament of more or less value presented to the bride at the betrothal – in modern practice an engagement ring. In time also the arrha (purchase money) became a gift to the bride instead of a payment to her father, though the latter retained it in trust for his daughter. The payment of the marriage settlement — and this the arrha was in effect - might be postponed during the lifetime of the husband, on his giving security for the transfer of an equivalent out of his estate to his widow. The purchase price for the bride thus became dower in form as it had al-ways been in essence and in intent. Some early Teutonic laws distinctly sanctioned the "robber-marriage," which was nothing more than an abduction, or, the bride being willing, was simply an elopment. The penalty the abductor was required to pay to the outraged father was usually identical in amount with the prescribed amount of the settlement or dower in the more orderly form of weddingindicating that barter marriage and robber marriage stood on about an equal footing of respectability. The Teutonic maiden when given in marriage was usually provided with an outfit for housekeeping and a dowry. Possibly an abducted bride would receive neither, which may be the reason why abductions were sometimes accomplished by connivance of the bride's family. In modern days elopments are often similarly motivated. There is nothing new under the sun, even in marriages Betrothals in a regularly arranged ancient Teutonic marriage were attended by festivities on a scale comparable with those attending the wedding itself. Indeed, some investigators of primitive law insist that the troth-plighting was not a mere promise to marry but was, in verity, the contract of marriage. The giving of a pledge (vadium) to bind the bargain would indicate to a person exercising ordinary common sense that the betrothal was no more than an executory contract It created an obligation to wed but did not actually establish a marital relation. The disputations on the subject have the appearance of mere quibblings with words. be sure, if one buys a thing to be delivered to-morrow and pays part of the price, a sale has doubtless taken place. Of course, a delivery is necessary to complete the transaction: and, if the thing purchased be a cow, it might be said that she is not under complete dominion

of the new owner until he has put her into his stable and locked the door. Possibly some such mental kinks is responsible for the suggestion of other investigators of ancient Teutonic customs that concubities was a legal essential to the consummation of a marriage. Be that as it may, the idea of a threefold stage in the process of acquiring a wife—the trothplighting, the wedding and the consummation—has persisted in legal phraseology and has colored even very modern legal conceptions. Early Teutonic law permitted a husband to put aside his wife for adultery or barrenness, and it seems to have countenanced dissolution of the matrimonial bond by mutual consent

From the very outset Christianity set its face against the looseness of the later Roman law respecting marriage. The legislation of the Christian emperors shows a reaction against the extremely liberal doctrines of the Antonine jurisconsults. The prevalent state of public opinion explains why, in the fusion of patriarchal practices, Roman jurisprudence and barbaric usages, so many retrogressive customs of the latter respecting the position of women should have found their way into the new alloy The principles of the Roman law prevailed in so far that unmarried women were relieved of bondage to the family after attaining their majority. But the position of married women became fixed in barbaric archaisms and the husband drew to himself all the powers that had belonged to the wife's male kindred. The Church declared marriage to be a sacrament and the consequence was the enunciation of the doctrine of the indissolubility of the matri-monial union except by death Through the decretals, through its influence on the custhe assumption of jurisdiction by the ecclesiastical courts over matrimonial questions, the Church established a universal marriage law throughout the Christian world The canonists accepted the principle of the Roman law the the consent of the parties is essential to the making of a legal contract of marriage, just as it is to the making of any other contract. The lack of free consent, because of a material error in fact or because of physical or moral duress, or because of natural or legal incapacity of one or both of the parties (impotency, insanity or minority) were declared insuperable impediments to the execution of the contract, and grounds for its annulment if executed. From the Roman law also the canonists carried over into their system the age of consent -14 for males and 12 for females - but they rejected the requirement of parental consent. In seeming contradiction to this, the father still "gives away" the bride in the marriage service. The Roman idea, that betrothal (sponsalia) was merely a promise to marry, was modified under the influence of Teutonic usage, by which the troth-plight was considered to have created the relation of husband and wife Ultimately the canonical law made a distinction between sponsalia de futuro and sponsalia de præsenti The former was declared a mere promise; but a present agreement (accipio) was held to constitute a valid marriage. Such a marriage if not consummated walthand tolerance tolerance was toleranced walthand tolerance was toleranced walthand tolerance was toleranced walthand tolerance was toleranced walthand tolerance was toleranced walthand tolerance was toleranced walthand toleranced was tolerance however, either by a vow of celibacy taken by one of the parties, or by special dispensa-tion. The troth-plighting in the marriage

service and the wedding of the bride with a ring may be reminiscences of the Teutonic hand-fasting and the payment of the vadium or pledge, while the marriage settlement looks very much like a modern variation of the transfer to the bride of the arrha Formidable impediments to marriages within the family, even between very distant relations, were created by the canons of consanguinity and affinity The degrees of kinship were measured from the common male or female ancestor downward in collateral lines of descent Each successive generation being but one degree further removed from the source of the blood, persons might stand in close relation to each other. though wide apart collaterally. Second cousins, for instance, were akin in the third degree by the canon, though the Levitical and Roman law would both place them in the seventh degree The earlier Church canon forbade intermarriage down to the seventh degree, so that sixth cousins could not enter into matrimonial relations with one another In the later Church law the prohibition ended with the third de-gree canonical, or with second cousins. Rela-tions by affinity or marriage were laid under similar disabilities as blood relations Sistersin-law and brothers-in-law were as incapable of contracting marriages as natural brothers and sisters; likewise the children of husbands and wives by former marriages. These prohibitions conform to a sense of delicacy and they accord with a not unreasonable interpretation of the Levitical canon But a reason for tracing relationship of any person to an uncle by marriage and to his children by a former wife and these children's children is hard to discover Nevertheless, these canonical restrictions were not without salutary effect. The practice of intermarriage between kindred, in order to keep property within the family, had become prevalent not only among the nobility but in all ranks. Near relationship in blood or by marriage might exist among the entire population of a small commune, and such cases were not exceptional under conditions of life that did not encourage travel or changes of habitation. By compelling men and women to seek mates outside their own little circle, the Church set a wholesome limit to inbreeding. The habitual shifting of population and the great freedom of locomotion in modern times have made the extreme restrictions of the canon law quite dispensable The Reformation produced important changes in the law of marriage. The Council of Trent pronounced clandestine marriages of minors to be nullities and required the presence of two witnesses in all cases The Protestant ecclesiastical law denied the indissolubility of the matrimonial bond and regarded all betrothals as, presumably, sponsaha de præsenti The words, "I will," Luther remarked, did not, in the Teutonic language, express a future tention but a present purpose; unless qualified so as to introduce an element of uncertainty any promise to marry, followed by conabita-tion, was to be considered a valid marriage. Indeed, cohabitation in conjugal relation was quite generally regarded presumptive evidence of a marriage per verba de præsenti, though the presumption was not conclusive. By acts the presumption was not conclusive. By acts of Parliament passed in the second half of the 18th and the first part of the 19th centuries,

church weddings were required in all cases and all marriages not thus celebrated were declared void Informal marriages, however, were still good in Scotland; and this circumstance ex-plains how Gretna Green became a Mecca for runaway lovers The statute of George II also made the parent's or guardian's consent essential to a valid marriage; but this requirement was rescinded later on A statute of Henry VIII had adopted the Levitical canon as the rule for reckoning degrees of consanguinity in England This permitted marriages between first cousins and persons of more distant relationship in blood, and it abolished, or was intended to abolish, all disabilities growing out of affinity or relationship by marriage. The Church of England, however, continued to the last in opposition to marriage with a deceased wife's sister, and still insists upon the indissolubility of the matrimonial bond except by

the death of one of the parties

In the eye of the modern law marriage is primarily a civil relation Most of the European codes and, with one or two exceptions, even those of Catholic countries, make a civil marriage and the registration thereof in the public records indispensable. A religious ceremony may follow at the option of the contractants, but is not legally essential A relation established by the civil authority can, of course, be dissolved by the same authority. Adherence to the doctrine of the sacramental character of marriage has become a matter of conscience; the law will not force obedience to the same. The modern law has generally raised the age of consent and has made the consent of parents or guardians necessary to the validity of the marriages of minors All marriages must be publicly contracted. In England the requisite publicity may be obtained either in accordance with the rites of the Established Church or other religious denomination, or in accord with the rules made by the public registrar or by statute. Betrothal almost everywhere is now considered merely a promise to marry, and actions to recover damages for a breach of the promise are permitted in only a few countries. The dissolution of marriages by consent of the parties is, generally speaking, disallowed, but almost everywhere divorces may be obtained by process of law — in Austria only between non-Catholics. The powers of married women to deal with property vary considerably In some of the French provinces the pre-Revolutionary coutumes gave to married women, below the rank of nobility, nearly all the independence which Roman jurisprudence in its final stages had allowed them These local customs together with parts of the Roman law became the basis of corresponding provisions of the Code Napoleon and through the latter and to some extent the Spanish law have affected the law of Louisiana and a few other States of the Union. Husband and wife by this law acquired no general interest in each other's property on marriage. The only property the wife brought into the matrimonial pot was her dot, or dowry, which is in the nature of a wedding gift from her family. While the husband did not become the owner of the dot, he had the use of the same during the continuance of the marriage. The husband could even sue the wife if she hindered him in the enjoyment of the usufruct thereof. Every species of property owned by the wife at the time of marriage or subsequent thereto could become the subject of a dotal gift. The most interesting disposition of property permitted to husbands and wives, however, was the creation of a communio bonorum The principle of the communio bonorum is that husband and wife shall have no property apart from one another All that either of them owned at the time of, or before, their marriage, and all that either or both together acquired while living in the marital relation, was included in the communal property. As in the case of a partnership in business, the community property could not be made answerable for the individual obligations of the parties to a communio bonorum until all joint obligations had been satisfied out of the same The husband became the managing partner or curator, however; the wife is excluded from every case in which her acts cannot be referred to an express or implied authority of the husband. The lator implied authority of the husband. ter incurs all debts or charges for the community. The community ceases on termination of the marriage relation either by agreement, divorce or death; in the latter event the rights of the survivor are fixed by law. The communio bonorum is a form of marital partnership recognized not only in Louisiana, but in Texas, Florida, Missouri, California and other States carved out of territory once in French or Spanish possession The principle has been greatly modified under influence of the common law and the modern statutes respecting the separate property of married women. The communio bonorum exists by legal presumption only with respect to property acquired during marriage, or in the name of either husband and wife, including the produce of their recuprocal industry and labor. The presumption may be rebutted by proof that any property so acquired was intended to be acquired as separate estate Separate property brought into the marriage by either party forms no part of the community, except by express agreement; nor does property acquired after marriage by gift or inheritance

In the United States a marriage may be either religious, civil or quite informal. Civil marriage was authorized, or required, in all the New England colonies. Milton's tractate on divorce and his denunciation of ecclesiastical "meddling" with marriage had borne fruit in the Civil Marriage Ordinance of Cromwell, passed in 1653. By this ordinance obligatory celebration before a justice of the peace was instituted, and a system of lay notice, certifica-tion and record was established. The action of the Puritans and Independents in England found ready followers in America. The States-General of the United Netherlands in 1656 adopted the principle of an older law of the provinces of Holland and Friesland, which had established a permissive form of civil marriage soon after their independence of Spain was achieved, and this naturally passed over into the law administered in New Amsterdam. For years the celebration of a marriage before a clergyman, as such, was illegal. Religious marriages were sanctioned later on throughout New England, and long before the close of the colonial era the dual civil and religious system was established, which has since prevailed. The "common-law" marriage, still recognized in most of the States, is nothing more than the canonical

stonsulia de præsenti under another name. Any agreement to marry per verba de præsenti, which is followed by cohalitation as man and wife, constitutes a legal marriage A presumption of marriage is raised when the parties have hved together in marital relations, have acknowledged themselves (or have been generally reputed) to be hisband and wife. This erally reputed) to be his and and wife This presumption, of course, is not conclusive and may be reducted. A relation, originally meretricious, will not be transformed into a marnage by a mere informal agreement. This also is in accord with the canonical law. In all the States formalities attending marriage are prescribed by statute Licenses to marry must be obtained, and the publication of the issuing of a license gives some sort of publicity, as does the requirement of the presence of witnesses and the making of marriages matters of public record The persons who may perform the ceremony, clergymen or civil officials, are designated. The clerk issuing the license must be satisfied, by affidavit or otherwise, that there are no legal impediments to the marriage, and, in cases of minors, the consent of parents or guardians is usually required. In most of the States, however, the statutory requirements have been held by the courts to be merely "directory" and not mandatory. Non-conformity may involve the non-conformers, and the officials and ministers concerned, in legal penalties; but the marriage is not invalidated. In Massachusetts, however, the courts have always insisted upon the observance of the statutory formalities, declaring such observance to be essential to the validity of a marriage. The Massachusetts rule has been followed in some States and in others the statutes are mandatory. For either of these reasons the "common-law" marriage may be deemed to have been abolished in California, Illinois, Kentucky, Massachusetts, Missouri, Maryland, North Carolina, Vermont and West Virginia. In New York (since 1901) non-ceremonial marriages must be evidenced by a written agreement, signed in the presence of two witnesses and acknowledged in the same manner. nesses and acknowledged in the same manner as a conveyance. The effort to secure the adoption by the States of a uniform marriage law has, thus far, been unsuccessful, and the greatest diversity continues to exist. Moreover, the general rule, that a marriage which is legal in the place where it is established will be regarded as formally perfect everywhere, permits the parties to evade inconvenient requirements of the laws of the place of their domicile by going out of the State to make the contract. The age of consent varies in the States, ranging from 16 to 21 years for males and from 14 to 18 years for females. Where the statutes are silent the canonical prescription of a minimum of 12 years for females and 14 for males still holds Infant marriages are voidable at the option of parents or guardians, if contracted without their consent. When any of the essential ingredients of a contract are lacking the marriage agreement, like any other contract, is a nullity. Consent being an essential, when one party or both have insufficient mental capacity to give intelligent assent no valid marriage can result. A misunderstanding as to a vital fact will avoid the contract, but only if the mistake was of such a character that there could have been no real consent. Duress excludes volition, and there is no such thing in law as involun-

tary consent Impossibility of performance avoids the contract. Impotence, meaning want of physical capacity, makes marriage a nullity; but sterility does not. The marriage of a person having a living and undivorced former spouse is a nullity. Null and void also are marriages between persons in the prohibited degrees of consanguinity All States forbid marriages between blood relations in the direct line of descent or ascent and between brothers and sisters of the half blood as well as of the full blood All States forbid marriage between uncles and nieces or nephews and aunts and in 20 States the prohibition extends to consanguines within the fourth degree, which bars marriage between first cousins. Affinity through marriage among collaterals is usually disregarded, but in the ascending or descending line, as between step-father and step-daughter or between father-in-law and daughter-in-law the prohibition is frequent. In 25 States whites and negroes are forbidden to intermarry, the laws often defining to a nicety the fractional part of African blood which vitiates the marriage. In five States the prohibition extends also to the marriage of whites with Chinese or other Mongolians, and in four States marriages between whites and Indians are forbidden. In recent years legislation on the subject of marriage has been affected greatly by eugenic considerations In Connecticut and Minnesota epileptics and feeble-minded persons are not permitted to marry and similar statutes have been enacted in other States as have laws prohibiting the marriage of persons afflicted with venereal diseases. Under these statutes those intending marriage must first undergo a physical examination before a marriage license is granted. These examinations include all of the rigid tests known to medicine. A woman on marriage usually takes her husband's nationality.

riage usually takes her husband's nationality.

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STEPHEN PFEIL.

MARRIAGE OF FIGARO, The ('Le Mariage de Figaro'), Beaumarchais' most popular play, possibly the wittiest and politically the most effective of all dramas, was ready for the stage in 1778, three years after the success of 'The Barber of Seville' (q.v.), to which it was a sequel. But even while in manuscript it

became the centre of intensely active and complicated political intrigue. Louis XVI rightly discerned in it danger to his throne, and it was not publicly presented till 1784, when it achieved a success till then unparalleled, being by strange irony most applauded by the aristocratic class whose ruin it portended. To Napoleon, after the event, it seemed "the Revolution already in action," and it certainly contributed greatly to hasten and provoke by its leveling tendencies the disintegration of the conventions and even the foundations of the old social régime, though this seems the result rather of Beaumarchais' delight in his own wit, of mere wantonness, than of a realization whither his work was tending or of any deliberate revolutionary purpose Figaro in 'The Marriage' is still the light-hearted, versatile, philosophic scapegrace of 'The Barber'; Almaviva and Rosine are what that play would lead one to expect they would be after some matrimonial disillusion. Of the new characters Suzanne, on whom Almaviva has set his vagrant fancy and Figaro his heart, is genially conceived, and Chérubin, the page and disquietingly precocious gallant, was a really daring creation, provoking reprobation and inviting controversy Figaro is successful in defending his beloved from the wiles of Almaviva, but it has been not unjustly said that if the object of comedy is to make vice ridiculous or odious or contemptible 'The Marriage' can hardly claim to attain it. Universal mockery, supremely vivacious, a wit whose brilliancy puts morality off its guard, mar ethically a drama whose on its guard, mar etinicarly a draina whose sustained excellence in dialogue had been hardly attained even by Molère. The best edition of 'Le Mariage de Figaro' is in 'Théâtre de Beaumarchias,' edited by d'Heyli and Marescot (Vol III) For the circumstances of its writing prohibitor, reception and contemporary ing, prohibition, reception and contemporary criticism, consult Loménie, 'Beaumarchais and His Times' (Vols III and IV), also 'Le Centenaire du Mariage de Figaro,' edited by A Paer (Brussels 1884) The play furnished the text for 'Le Nozze di Figaro,' a popular opera by Mozart (1786). BENJAMIN W WELLS

MARRIED WOMEN, Legal Status of.
See HUSBAND AND WIFE

MARRIED WOMEN, Right to Conduct Business. See HUSBAND AND WIFE

MARROW, a substance of soft vascular tissue filling the cells and cavities of the bones of mammals. It contains fat and both red and white blood corpuscles and is a valuable constituent of soups. The bone contents of mammals show wide variation. The largest constituent is usually water, but some marrows, as of the long bones, are mostly a yellow oil. Traces of albumen, fibrin and salts are also found. Red bone-marrow is highly nutritious and is recommended for anæmia. (See Bone). The vegetable marrow is a species of squash (Cucurbita ovifera), of oval form, ribbed and greenish-yellow color.

MARRYAT, măr'i-at, Florence, English novelist, daughter of Frederick Marryat (q.v.): b Brighton, 9 July 1838; d London, 27 Oct. '899. She was successively Mrs Church (1854-90) and Mrs. Francis Lean Her many novels, although not at all remarkable, were popular, and were published in various versions through-

out Europe. They include 'Nelly Brooke,' 'Fighting the Air,' 'Facing the Footlights' and more than 80 others, many being devoted largely to spiritualism. She published and edited her father's 'Life and Letters' (1872).

MARRYAT, Frederick, English naval officer and novelist b. London, 10 July 1792; d Langham, Norfolk, 9 Aug. 1848 In 1806 he entered the navy, served on the coast of North America in 1811 in the Æolus, and in 1823 was commander of the Larne during the first Burmese War, in 1825 had the naval command of a successful expedition up the Bassein River, and in the same year was made captain of the Tees. From 1828 until his resignation in 1830 he commanded the Ariadne. He received the gold medal of the Royal Humane Society (1818) for saving life at sea; adapted to the mercantile marine Sir Home Popham's system of signaling; was elected Fellow of the Royal Society in 1819, and was also something of a caricature artist. He is best known, however, for his stories of the sea, beginning in 1829 with 'The Naval Officer.' The most familiar of them is 'Midshipman Easy' (1836), in which his chief characteristics, lifelike and circumstantial narration and a rollicking humor, appear perhaps at their best. Others of the series are 'The King's Own' (1830), probably the best constructed of his works; 'Newton Forster' (1832); 'Peter Simple' (1834); 'Jacob Faithful' (1834); 'The Pacha of Many Tales' (1835); 'The Pirate, and the Three Cutters' (1836); 'Snarleyyow' (1837); 'The Phantom Ship' (1839); 'Poor Jack' (1840); 'The Privateer's Man' (1846). He wrote also a series of juveniles, chief of them 'Masterman Ready' (1841) He visited Canada and the United States in 1837–38; and recorded his impressions in 'A Diary in America' (1839). pear perhaps at their best. Others of the series pressions in 'A Diary in America' (1839), which gave some offense to the people of the nation, then hypersensitive to foreign criticism. In 1832-35 he edited the Metropolitan Magazine, in which he published a review of N P. Willis' (Pencilings by the Way,) which the latter, then in England, considered abusive. Willis challenged Marryat, and they exchanged shots at Chatham without injury. (See MIDSHIPMAN EASY, MR). Consult Marryat, F., 'Life and Correspondence' (1872); Hannay, 'Life' (in 'Great Writers' series).

MARS, Anne Françoise Hippolyte Boutet Monvel, an fran-swaz e-po-let boo-tā monvel mars, usually called Mademoiselle Mars, French actress: b. Paris, 5 Feb. 1779, d there, 20 March 1847. As Célimène in Molière's 'Misanthrope,' and Elmira in 'Tartuffe,' as well as in several similar characters in the plays of Marivaux, she was very great Louis XVIII settled on her, as well as on Talma, a pension of 30,000 francs. She retired in 1841.

MARS. Mars is the fourth planet from the Sun, its orbit being considerably more eccentric than the Earth's. The eccentricity is exceeded only, among the nine large planets, by that of the orbits of Mercury and of Pluto, and amounts to 0.093, while its mean distance from the Sun is 141,500,000 miles. This large eccentricity causes considerable differences in the planet's distance from the Sun, the change being from 128,300,000 to 154,700,000 miles at perihelion and aphelion respectively. As the orbit of Mars is wholly outside ours, Mars may ap-

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proach us, under the most favorable circumstances, to within 34,600,000 miles at opposition, i.e., when the planet is on the meridian at midnight and hence most advantageously placed for observation, while it can recede to 250,000,000 miles then the best of the contraction. miles when it is behind the Sun. At an average opposition, however, Mars is 48,000,000 miles distant. Its magnitude therefore can vary from -2.8 to +1.6, which amounts to a change of 55 times in brightness. The siderial period of Mars contains 687 of our days, but its synodic, from one conjunction to the next, is 780 days. Though Venus approaches us more nearly, yet this happens when Venus is between us and the Sun and hence unobservable. Mars, on the contrary, is most favorably placed when nearest, and therefore can be observed under better circumstances than any planet. Despite this fact, as the planet has an atmosphere, there is a very slight uncertainty is a very slight uncertainty in its diameter, due to the difficulty of exactly allowing for the height of this atmosphere over the solid surface and for the effects of irrada-tion The value usually accepted is 4,206 miles; photographs in yellow light however give 4,240 miles. Results at the Lick Observatory, largely due to W. H. Wright, give a value for the solid globe of 112 miles less than this This implies an atmosphere which is appreciable enough to show up on the photographs 56 miles above the surface. It must be understood that this is by no means the probable height of the whole atmosphere, the upper and less dense parts of which probably are not recorded on the plates. The apparent diameter varies from 3".5 at conjunction to 25".1 at a most favorable opposition. It can at once be seen that when nearest an angle of 1" at the distance of Mars corresponds to 168 miles. Obviously then an object subtending an angle of 0".1 is 17 miles wide, and, as this approaches the smallest angle that can, under perfect conditions, be seen using the largest refracting telescopes in existence, it needs no further argument to show the impossibility of seeing really small surface features on Mars. For instance, the Himalayas would be less than 0".04 high on the limb of the planet, an angle quite undetectable with any telescope. It therefore seems very strange that many books assert the planet has a relatively smooth surface, for even our highest mountain ranges, if there, would not show up directly. Also, as the shadows are not sharp as on the atmosphereless Moon, it is very doubtful if we could detect them by means of the shadows they cast, though with a low Sun these latter would much exceed the angular heights of the mountains themselves, when on the planet's limb. Even the effects of sunrise or sunset on the tops of mountains, just beyond the terminator, would be difficult to detect, due to the greater thickness of the Martian atmosphere through which we would have to observe them in this twilight region.

The mass of Mars is 0.108 that of the Earth, or about one three-millionth that of the Sun. Its density is 4.0 times that of water, and bodies on its surface would weigh only 0.38 what they do with us. This latter means that, could a man be transported to Mars, keeping his muscular strength and suffering no ill effects, his weight would be only 38 per cent of what it is on the Earth, and he would be able to accomplish far more with less effort. It also proves that the

«velocity of escape» for gases is much lower for Mars than for the Earth, and hence that planet would be less able to retain gases in its atmosphere The lighter ones would largely or wholly escape. It is calculated that Mars reflects about 15 per cent of the Sun's light falling upon it, which means that it has twice as good a reflecting surface as the Moon. Yet even this reflecting power corresponds only to that of dark rocks The greatest deviation from the full phase is the gibbous and when near quadrature the disk is far from circular. Mars is usually brighter near the limb than in its center, but not along the terminator. The planet is also slightly flattened at the poles, and theoretical reasons make us believe that it is the most nearly homogenous of all the eight planets which can be studied—Pluto is too small to be measured. The equator of Mars is inclined about 24° to the plane of its orbit; this means it has seasons exactly like our own. The day on Mars is 24 hours 37 minutes 23 seconds long; therefore, only about half an hour longer than the day here. Hence, so far as diurnal and seasonal phenomena are concerned, we find a strik-ing similarity with our Earth. The amount of heat received per square mile on Mars averages 44 per cent of that we receive, but due to the eccentricity of its orbit at perihelion the heat is 145 greater than at aphelion. The southern hemisphere of Mars now, as with us, happens to have longer and colder winters, with shorter and hotter summers, due to this cause

The planet possesses two small satellites or moons: Phobos, distant only 5,800 miles from the planet's center and making its complete siderial revolution in 7 hours 39 minutes; and Deimos, distant 14,600 miles, in 30 hours, 18 minutes. Both bodies are small, probably less than 10 miles in diameter. They were discovered in 1877 by Asaph Hall (qv.) with the Washington 26-inch refractor, then the finest existing telescope. They can never be seen through small telescopes, and only under good conditions through the largest Bearing this fact in mind, a most remarkable statement, made by Dean Swift in his 'Gulliver's Travels,' published in 1721, must be mentioned. This was a century and a half before anyone knew these satellites existed, and about a century before any instrument was made with which they could possibly have been seen. The quotation is as follows:

«Certain astronomers . . . have likewise discovered two lesser stars, or satellites, which revolve about Mars, whereof the innermost is distant from the center of the primary planet exactly three of its diameters, and the outermost five; the former revolves in the space of ten hours, and the latter in twenty-one and a half . . . which shows them to be governed by the same law of gravitation . . .»

When it is noted how very close Swift came to the truth, not only in merely predicting two small moons but also the salient features of their orbits, there seems little doubt that this is the most astonishing "prophecy" of the past thousand years as to whose full authenticity there is no shadow of doubt. The nearness of Phobos to the planet's surface means that it can never be seen from large areas in the polar regions. Its period of less than eight hours obliges it to rise in the west and set in the east. In this latter respect it is unique among all bodies in the universe, so far discovered. Yet Swift had

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this fact also included. On account of their very small size, they can give little "moonlight" to the planet and only the phases of Phobos could be seen without optical aid Phobos is so near the planet's surface that it would appear much larger when on the meridian than when rising

or setting.

To the average eye Mars is red, but when a telescope is used, it is found that orange-red is the prevailing color of the disk. The reddish color of the planet, when the absence of an appreciable per cent of oxygen in its atmosphere is remembered, has led to the following suggestion. When terrestrial rocks weather, rust appears, which is the uniting in them of iron and atmospheric oxygen Such rust is reddish Can it be that most of the presumably scanty supply of oxygen on Mars has so disappeared, leaving a reddish soil as a result? There are, however, darker areas of various sizes as well as two easily discernible polar caps. In fact, these latter can be seen with a small telescope. The socalled canals appear first to have been announced by Giovanni Schiaparelli in 1877 and his maps of the planet, though made with a telescope of only 86 inches aperture, showed a wealth of detail never before equaled by observers. The darker markings are of a greenish-blue color and lie mostly in a belt south of the equator. They cover nearly 40 per cent of the surface The most easily seen of these is a projection, not unlike India in shape, which reaches well in the northern hemisphere. This is so easily recognizable that it can be identified certainly on drawings by Robert Hooke and Christian Huygens made over 200 years ago, and when compared with modern observations is the basis for the extremely accurate rotation period. As the planet's day so nearly equals ours in length, the same features on its surface, at the same hour of observation on successive nights, are but slightly displaced. The reddish areas undergo little variation in appearance, changes occur mostly in the polar caps and dark regions. The cap, in the hemisphere where winter prevails. extends nearly half way to the equator, but as the Martian spring equinox approaches, the cap begins to shrink along its edges, rather uniformly, so that by the summer solstice it may be some 500 miles in diameter and later in the summer very much smaller. In fact, during some years, the southern cap has wholly vanished; the northern never entirely disappears though decreasing to 200 miles in diameter. After the autumn equinox, the white material again forms, generally in isolated patches and overnight. These eventually joining form the continuous cap which lasts throughout the winter. One of the proofs that the planet's surface ter. One of the proofs that the planet's surface is not wholly at what would be the equivalent of sea level is that the locality in the south cap where it is longest visible is not the pole itself but an area 250 miles distant. This area must therefore be at a considerably higher level There are some other phenomena reported, over regions where the Sun has just risen, that re-semble the actions of hoarfrost. It was once believed the darker areas were bodies of water; this is now admitted to be impossible as the reflection of sunlight is never seen from them, and their color, sometimes even their size, changes with the seasons or perhaps in different years. As a generalization, such regions are more prominent in the hemisphere which has

spring; their tints fade or turn yellowish in autumn. In some cases, a brown color has been reported for winter.

Turning now to the canals, Schiaparelli announced the discovery over the reddish parts of Mars of numerous fine, dark, straight lines for which, in the original Italian article, the word canali was used. This word means channels as well as canals, but while the former signification seems to have been intended, the translation canals had a greater appeal to the imagination and hence was adopted popularly. In 1881 he and hence was adopted popularly. In 1881 he announced many were double In 1892 W. H. Pikering detected small spots, connected with the canals, and in 1894 A. E. Douglas noted canals in the dark areas also. Percival Lowell, the founder of the observatory of that name and an indefatigable observer of the planet, believed that he fully confirmed the straightness and narrowness of the canals, as well as their duplication. At Lowell Observatory over 400 were mapped However, E. E. Barnard, perhaps the most skillful of all American observers, saw no such complicated geometrical system of fine lines, though he used the two largest of all refractors, those at Lick and at Yerkes Observatories, as well as the superb 60-inch Mount Wilson reflector. On the contrary, he reported shorter, wider, and more diffuse lines, and also many small dark spots; and further, that with the best seeing conditions a wealth of detail could be glimpsed quite beyond human skill to fully delineate. E. M. Antoniadi, working with the great 32-inch Meudon refractor in France, confirms the lack of fine, geometrical lines, and the presence of an infinite amount of small detail, glimpsed in the rare moments of perfect seeing Other observers take a midway position. It may be asked at once why cannot all skillful observers, having the use of great telescopes, see the same thing? And further, why cannot pho-tography settle the question? It will be remembered it was shown that, even when nearest, 1"0 on Mars equaled 168 miles. It is difficult under ordinary conditions to detect a dark line on a bright planet which is less than 0".2 wide, almost impossible if it is below 0".1. These are equivalent to 34 and 17 miles respectively For the lines to show up, as Lowell drew his canals, they would have to be from 15 to 30 miles wide, at least. When detail is near this limiting size, no two pairs of eyes see it exactly alike since it is always at the extreme limit of vision. It is therefore not strange that observers, straining their eyes to the utmost, often put in detail others do not see or draw it differently Everyone can see the larger topographical features and all agree fairly well on their outlines. It is the finer details over which controversy occurs. As to photography, even with an enlarging lens, the size of Mars on the plate is very small. Photographs in great numbers exist that show the polar caps, dark areas, even areas tempo-rarily shrouded by clouds, but no possible photographic technique comes anywhere near equaling trained human eye in ability to detect fine planetary markings. The reasons for this may not be discussed here for lack of space, but are perfectly well known. Hence photography is inadequate to prove or disprove the existence of the narrower canals. Lowell and some of those who agreed with his delineation of what they observed on the planet's surface aroused great popular interest because they believed the

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canals had been dug by intelligent beings, seeking to conserve a pitifully inadequate water supply for their needs It is but just to point out that these astronomers did not believe the canals themselves to be of the widths mentioned. Their idea was that the vegetation growing along the narrow channels would cause the effects they saw and recorded as narrow straight lines An example would be an airplane picture at very great height over the Nile Valley The river itself might not show up, but the strip of vegetation, going out to several miles on either side, would appear as a narrow dark line The spring melting of the polar caps was thought to be the source of the scanty and precious supply of water.

Fantastic theories of supermen and a society which had evolved far beyond ours may be found in various articles and books published during the period from 1880 to 1920, since then, serious writers have become more conservative. This is due to more recent evidence as to the constitution of the Martian atmosphere and the actual measurement of the temperature of various localities. While the atmosphere was known to exist two centuries ago, only refined spectroscopic observations could show the presence of oxygen and water vapor, the two constituents considered essential to biological life. The earlier observations confirmed the presence of both, but in quite small quantities. More recent ones from Mount Wilson, however, made with more powerful spectroscopes, have failed to re-veal any trace of either. It is but fair to say that this does not mean that absolutely no oxygen or water vapor is present; only that their amounts are less than 0 001 for the former and 005 for the latter, as compared with our atmosphere. Mars' spectrum is practically that

of reflected sunlight only. On the contrary, we have the evidence of the polar caps, covering large areas, and shrinking with the advent of summer, and by analogy we could assume them to be composed of snow and ice Further, at times, details in restricted areas of the planet simply disappear from view, as though covered by fog, clouds, or a haze of dust. Lastly, actual clouds have been seen, in relief, on the terminator of the planet, at considerable heights above the surface But clouds of this sort have been rarely noted, nor is the fog very often reported. Series of photographs have been taken in light of different colors, both W. H. Wright at Lick and E. C. Slipher at Lowell having had remarkable success. Certain facts become evident on examining these plates. First of all, the polar caps are more conspicuous in violet light, so much so that on some plates they actually seem to protrude from the disk. In this same light, however, all ordinary details of the surface practically disappear, and what remain visible have vague outlines. Also images taken in violet or ultraviolet light are measurably larger than those taken in red light. Wright compared pictures of Mars taken in two wavelengths with two of the landscape west of the Lick Observatory, using the same color screens. The distant terrestrial mountains are almost invisible in the violet, but every detail stands out in the infrared. As mentioned, somewhat the same effects are found for the Martian surface. This would imply considerable optical density for the atmosphere of Mars, which obviously allows rays of longer wave length to penetrate

quite as with the Earth's. The difference in size of the violet and infrared images should then give a definite clue as to the thickness of that part of the atmosphere where appreciable absorption exists As stated, this value is about 56 miles. With regard to the protruding polar caps, Wright is inclined to believe them, at least in part, as cloud caps floating over whatever may lie beneath Even if the white substance we see is snow and wholly on the surface, we know nothing of the thickness of the mantle A few inches covering the ground would look the same to us as would a layer a thousand feet thick. Other substances have been suggested, but most astronomers still believe there exists a thin layer of snow, despite negative spectroscopic evidence as to water vapor. Most of the seasonal changes can also be explained in this

simple way.

One of the indisputable laws of science is that light and heat vary inversely with the square of the distance. As Mars averages about 15 times as far from the Sun as does the Earth. the quantity of heat received there per square mile should be 4/9 of that received here. Turning this into temperature has technical but not insuperable difficulties For Mars, the calculated extremes at mean distance would be -51° to +43° C, the correct value probably lying between these limits. Measures made at both Lowell and Mount Wilson Observatories have agreed on the following: that along the sunrise edge of the planet we find the temperature about -10° to -20° C, at the center of the disk (for noon) from +20° to +30° C, and for the sunset edge -10° to +10° C. The values found for the polar caps vary enormously, the lowest being -70° C. In view of these figures, we may decide that the earlier conclusion of some scientists that Mars' surface never is above freezing, 1 e., 0° C, is mcorrect. Further, that at noonday temperatures are found which would be comfortable enough near the equatorial regions, but even there the nights must be very cold indeed. The Lowell measures show the dark areas are warmer than the reddish ones, which Wright believes inimical to the theory they represent areas of vegetation Later measures at Mount Wilson confirm that at aphelion the temperatures on Mars should be 27° C lower than at perihelion, where the earlier measures were usually made Therefore, on the average, Martian temperatures are 14° lower than the values at perihelion and the various parts of the planet would be colder than the values given above by about this amount

In view of all the facts outlined we may come to some fairly intelligent conclusions about the chances for life existing on Mars. On the favorable side we find the length of day and the type of seasons approximately like our own. The lower surface gravity need not be a handicap, and the planet's surface, while only 283 per cent of the Earth's, is still large enough for a great population. Sunlight also is adequate. On the unfavorable side we find a temperature which is semiarctic. The atmosphere of the planet, though extensive, is probably tenuous. Also for life to exist as we know it, and that is all we can discuss scientifically, the excessively low relative percentage convygen and water vapor, if not their total absence, seems to make all higher forms absolutely impossible. Nor is there good reason to believe there were, in "geologically recent" times, large quantities

of these gases which have since so gradually disappeared that higher species could adapt themselves to their loss and still survive by modification of their lungs or other organs Yet there seems some observational evidence that vegetation exists, at least, certain phenomena can be most simply explained in this way. Hence, without venturing a positive opinion, there are grounds for this belief, and if vegetation exists, then low forms of reptile or other animal life might be inferred. But the supposition that higher forms exist, such as mammals, stretches one's imagination beyond any bounds which science can substantiate. The attempts at planetary intercommunication, even if there were beings to receive our messages, are not as yet subjects for serious consideration. The ideas advanced for travel from planet to planet are simply wildly imaginary and take no proper account of perfectly well-known facts and natural laws. Thus radio messages to Mars, much less reaching the planet by rocket-ships or similar devices, are at present wholly beyond the limits of serious scientific study.

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MARS, the legendary god of war; in Roman mythology, contracted from Mavers or Mavors, in the Sabine or Oscan language Mamers, was at an early period identified by the Romans with the Greek Ares As the Italian Mars was originally a divinity of a very different nature, the two conceptions must be treated separately. Originally Mars was an agricultural deity surnamed Silvanus, and propitiatory sacrifices were offered to him as the tutelary god of fields As the Italian shepherds were familiar with war, the transition from the idea of Mars as an agricultural to that of a warlike deity was natural and easy. He was regarded as the father of the Roman people, for, according to tradition, Romulus and Remus, the founders of Rome, were the fruit of his inter-course with Rhea Sylvia. Several temples in Rome and the Campus Martius were dedicated to him, the most important of which was that outside the Porta Capena, on the Appian Road, and that of Mars Ultor, built by Augustus in the forum. His service was celebrated not only by particular flammes devoted to him, but by the College of the Salii, or priests of Mars. The month of March (qv.), the first month of the Roman year, was sacred to him and his festivals were celebrated every year in the Circus on the 1st of August. The Campus Martius, where the Roman youth engaged in athletic and military exercises, was named after him. (See Aries). Consult Fairbanks, A., 'Mythology of Greece and Rome' (1907).

MARSALA, mar-sa'la, Sicily, a seaport town, near the mouth of a river of the same name, on the low promontory of Cape Boeo, 18 miles southwest of Trapani It was known as Lilybæum in the time of the Carthaginian supremacy It obtained its present name from the Saracens, who valued the port so highly that they called it Marsa Alla, or Port of God It has now excellent schools of technology and agriculture and a large public library. The harbor has been greatly improved. The most important export is Marsala wine, which resembles sherry, grain, soda and salt are also exported. Pop of commune, 73,000

MARSDEN, marz'děn, Samuel, Anglo-Australasian missionary: b Horsforth, near Leeds, 28 July 1765; d. Windsor, New South Wales, 12 May 1838. After study at Cambridge and ordination in 1793, he went in 1794 as chaplain to the convict settlement at Parramatta, Australia, where his model farm became self-supporting and contributory to the development of local schools and missions. In 1814 he extended his work to New Zealand among the Maoris who through his efforts became Christianized, received a dictionary and grammar of the Maori language and adopted a fixed form of government Consult Marsden, J. B., 'Life of Samuel Marsden' (London 1859)

MARSEILLAISE, La, the French national anthem, a revolutionary song, composed by an engineer officer, Rouget de Lisle, during the night of 24-25 April 1792 in Strassburg The song quickly spread The people of Marseilles adopted it to be sung at the meetings of their clubs. It was they who carried it all over France, and hence from them it received its name. De Lisle was a proscribed royalist at the time. His mother wrote to him in alarm, asking, "What is this revolutionary hymn, sung by bands of brigands who are prowling through France and with which our name is linked? He had originally given it the name of 'Le chant de guerre pour l'armée du Rhin' ('Battle Song of the Rhine Army)). Lamartine wrote that De Lisle himself was terrified at the tremendous effect of his composition: "It was the fire-water of the Revolution, which instilled into the senses and soul of the people the in-toxication of battle. Carlyle describes it as "the luckiest musical composition ever promulgated, the sound of which will make the blood tingle in men's veins; and whole armies and assemblages will sing it, with eyes weeping and burning, with hearts defiant of Death, Despot and Devil." On 8 Jan. 1795 the Directory ordered the air to be played at all theatres. Its inspiring strains are known throughout the world more than perhaps any other melody. During the Empire and the Restoration the Marseillaise was suppressed as a revolutionary demonstration, but was revived with the July Revolution of 1830 The original version consisted of only six couplets; the seventh was added when it was dramatized for the Fête de la Fédération, in order to complete the characters among whom the verses were distributed, namely, an old man, a soldier, a wife and a child The stanza commencing with "Nous entrerons" is the one added, intended for the child part. It was written by Dubois, editor of the Journal de la Littérature The complete version follows, with a strict translation.

LA MARSEILLAISE.

Allons, enfants de la Patrie, Le jour de gloire est arrivé, Contre nous de la tyrannie, L'etendard sanglant est levé Entendez – vous dans cus campagnes
Mugir ces feroces soldats '
Ils viennent jusque dans vos bras
Egorger nos fils, nos compagnes |
Aux armes, citoyens | formez vos bataillons!
Marchons, marchons, Q'un sang impur abreuve nos sillons!

Que veut cette horde d'esclaves, De traîtres, de rois conjures? Pour qui ces ignobles entraves,
Ces fers dès longtemps preparés?
Français, pour nous, ah' quel outrage!
Quels transports il doit exciter!
C'est nous qu'on ose mediter
De rendre à l'antique esclavage. Aux armes, etc.

Quoi' ces cohortes étrangères
Feraient la loi dans nos foyers?
Quoi! ces phalanges mercenaires
Terrasseraint nos fiers guerriers?
Grand Dieu! par des mains enchaînées
Nos fronts sous le joug se ploieraient!
De vils despotes deviendraient
Les mattres de nos destinées.

Aux armes etc. Aux armes, etc.

Tremblez, tyrans, et vous perfides, L'opprobre de tous les partis, Tremblez! vos projets particides
Vont enfin recevoir leur prix!
Tout est soldat pour vous combattre.
S'ils tombent, nos jeunes héros, a terre en produit de nouveaux Contre vous tout prêts à se battre!
Aux armes, etc.

Français, en guerriers magnanimes, Portez ou retenez vos coups, Epargnéz ces tristes victimes A regret s'armant contre nous Mais ces despotes sanguinaires, Mais les complices de Bouillé, Tous ces tigres qui sans pitié Dechirent le sein de leurs mères! Aux armes, etc

Nous entrerons dans la carrière Quand nos aînés n'y seront plus; Nous y trouverons leur poussière Et la trace de leurs vertus! Bien moins jaloux de leur survivre Que de partager leur cerceuil, Nous aurons le sublime orgeuil De les venger ou de les suivre! Aux armes, etc.

Amour sacré de la Patrie, Conduis, soutiens nos braves vengeurs; Liberté, Liberté, chérie, Combats avec tes défenseurs! Sous nos drapeaux que la Victoire Accoure à tes mâles accents, Oue tes engemis expurants Que tes ennemis expirants Voient ton triomphe et notre gloire! Aux armes, etc

THE MARSEILLAISE.

Come, children of the fatherland, The day of glory now is here, By tyranny against us The bloody banner is raised. Do you hear in the land Those ferocious soldiers roar? Those feroclous solutiers roarr Up to our arms they come, Strangling our sons, our women!
To arms, citizens, form your battalions,
Let us march, let us march!
That the foul blood may drench our furrows!

What seeks this horde of slaves, what seeks this forme of slaves, Of traitors and conspiring kings? For whom these base manacles, These trons already long prepared? For us, Frenchmen, ah, such outrage! What passions it must raise! 'Tis us whom they dare purpose To restore to former slavery

What! shall these foreign cohorts What shall these foreign conorts
Make the law in our homes?
What shall these hireling phalances
Throw our proud warniors down?
Great God with fettered hands,
Our heads bowed down beneath the yoke! And despots vile become The masters of our destinies

Tremble, ye tyrants and traitors, The shame of every faction, Tremble! your particulal projects Shall at last gain their reward! Each one is soldier to fight you. And if our young heroes fall, The land shall produce them afresh All ready to struggle against you!

Frenchmen, as magnanimous warriors, Restrain or deal your blows, Spare those sad victims Who reluctantly armed against us. But those bloody despots —
Those accomplices of Bouillé —
All those typers who put lessly All those tigers who pitilessly Lacerate the bosoms of their mothers!

We shall begin our career When our elders are no more; Yet we shall find their ashes And the trace of their virtues! Less eager to survive them Than to share their tomb, It shall be our sublime pride To avenge or follow them!

Sacred love of fatherland, Guide, sustain our brave avengers; Liberty, dear Liberty, Fight with thy defenders! That victory under our flags
Shall hasten to thy noble call;
And may thy dying enemies
Behold thy triumph and our glory!

MARSEILLES, mar-sālz, or MAR-SEILLE, mar-sā-yē, France, the principal commercial seaport of the country, a first-class military and naval station, the second city of MARSEILLES, France as regards population, and the capital of the department of Bouches-du-Rhône, 508 miles southeast of Paris It stands on the northeastern shore of the Gulf of Lyons, and on a bay containing a group of islets, one of which, the Château d'If, has world-wide celebritis and the château mith the added Department of the château contains with the added Department of the château contains with the added Department of the château contains with the added Department of the capital contains with the capital contains with the capital contains and the capital contains the capital contains a contains with the capital contains a contains with the capital capital contains a contains with the capital cap rity in connection with the elder Dumas'

'Monte Cristo.' The city is strongly defended by various works, and hes in the form of an amphitheatre round a natural harbor of moderate size (about 70 acres), known as the Old Harbor. From the Old Harbor one of the finest of the city thoroughfares, called the Cannebière, runs inland in a straight line; while at right angles to this another great thoroughfare traverses the city, planted with trees, lined with fine edifices and bearing dif-ferent names at different points. In the older part of the town the streets are narrow and irregular, but in general the streets are spacious and regular and lined with handsome houses. Marseilles, however, is not rich in public edifices. The chief are the large cathedral, in the Byzantine style, consecrated in 1893; the church of Notre Dame de la Garde, a modern Romanesque building, on a hill of same name, whence a splendid view is obtained; the church of Saint Victor, a building of great antiquity; the Hôtel de Ville, the Prefecture; the Palais des Arts de Longchamp, containing a picture-gallery and natural history museum; the exchange; the public library (120,000 vols.); the palace of justice or law courts; the episcopal palace, etc. Marseilles is the see of a bishop and possesses. Marseilles is the see of a bishop and possesses a court of first instance, a mint, an Academy of Sciences, Belleslettres and Arts, various learned societies and educational institutions

Marseilles improved greatly in regard to street architecture, sanitary matters, etc, and made great progress in extent, population and commerce, largely owing to the conquest of Algeria and the opening of the Suez Canal Including Old and New Harbors, the total water area is 414 acres; there are seven wet docks, with depths at ordinary tides ranging from 25 to 66 feet, six dry docks and 13 miles of quayage Vessels entered in 1936, 6,748, of an aggregate of about 13,100,000 tons. The traffic in merchandise had grown from 4,372,000 tons in 1870 to 20,000,000 tons in 1926. From the Durance an abundant water supply has been derived. A canal irrigates the neighboring slopes and plains and has transformed them from and tracts into fruitful fields. The surrounding districts are now occupied by new population, employed in raising vegetables, fruit, etc, on the reclaimed and improved lands. The Marseilles-Rhone Canal, intended to open up waterways from Marseilles to the interior of France and central Europe, was authorized in 1903, and was completed and opened in 1926. The canal, which is 50 miles long, has no locks and is at sea-level throughout its entire course, and with its tributaries, forms a series of waterways 350 miles long, navigable by heavy barges. The most important manufac-tures are soap, soda and other chemical products; also olive and other oils, sugar, machinery, iron and brass work, matches, candles, glass, earthenware, Oriental hosiery, etc. In the building-docks a great number of war and other vessels are built. The trade consists chiefly of soap, olive-oil, swine, brandy, corn, flour dried fruits oranges and other products flour, dried fruits, oranges and other products of the southern departments; salt provisions, tobacco, wool, skins and hides, iron, raw cotton, cotton twist, dye-woods and American novelties. Marseilles is the headquarters of the 15th army corps and is the seat of a United States consulate. During the World War 1914-18 it was a center of great naval activity a chief port of debarkation for the world-converging armies of the Entente Allies.

Marseilles was founded by a colony of Greeks from Asia Minor about 600 years before Christ, the original name being Massalia, and the Greek language is said to have been spoken here for several centuries before Christ. Its progress for centuries was rapid and almost without interruption. Having taken the part of

Pompey in the great contest for supremacy between him and Cæsar, it was besieged by the latter and taken in 49 BC On the decline of the Roman Empire it became a prey to the Goths, Burgundians and Franks. In 735 it fell into the hands of the Saracens, who completely destroyed all the ancient monuments which the barbarians had spared In the 10th century it fell under the dominion of the counts of Provence and for some centuries after followed the fortunes of that house. Pop. (1936) 914,232.

MARSEILLES, Ill, city in La Salle County; alt. 506 feet; on the Illinois River; 77m. SW. of Chicago, on the Rock Island Railroad. Here the Illinois and Michigan Waterway bypasses a two-and-one-half-mile stretch of rapids via the Marseilles canal and lock. Industrial products of Marseilles are building and roofing materials, paper cartons, and chemicals. The 400-acre Illini State Park has recreational facilities, and is a bird-and-game refuge Commission government was adopted in 1912. Pop. (1930) 4,292; (1940) 4,455.

MARSH, George Perkins, American scholar and diplomat: b Woodstock, Vt., 15 March 1801; d. Vallombrosa, Italy, 23 July 1882 He was graduated at Dartmouth in 1820; studied law at Burlington; was elected to the Supreme Executive Council of Vermont in 1834; sat in Congress from 1842 to 1849, when he went to Constantinople as Minister for four years, and in 1852 was sent on a special mission to Greece. In 1861, after seven years in the United States, he went to Italy as Minister, and held that post until his death. An able English philologist, Marsh wrote 'Lectures on the English Language' (1861); 'The Origin and History of the English Language' (1862); 'Man and Nature,' in which he urged forest planting and forest preservation (1864), etc. He edited Wedgewood's 'Etymology,' and translated Rask's 'Icelandic Grammar.' Consult the 'Life and Letters' edited by his widow (1888).

MARSH, Othniel Charles, American palæontologist: b. Lockport, N. Y., 29 Oct. 1831; d. New Haven, Conn., 18 March 1899. He was graduated from Yale in 1860, studied in 1860-62 at the Yale (now the Sheffield) Scientific School, in 1862-65 at the German universities of Parlia Heidelberg and Parlia and from 1866. Berlin, Heidelberg and Breslau, and from 1866 until his death was the first professor of palæ-ontology at Yale. From 1882 he was vertebrate palæontologist to the United States Geological Survey, his field-work for the survey ceasing in 1892. His investigations in regard to extinct vertebrates are very important and were declared by Charles Darwin to furnish some of the most satisfactory evidence of the evolutionary theory. He made particular study of the Rocky Mountain region, and from 1868 almost annually organized and conducted expeditions into that district In these explorations he discovered over 1,000 new fossil vertebrates, of which he classified and described more than one-half. Among his discoveries are those of the Odontornithes, a subclass of Cretaceous birds, with teeth; the Dinocerata, ungulate animals of the Eocene period, elephantine in size; the first known American pterodactyls, or flying lizards, and several new families of dinosaurs. Perhaps he was best known for his study of the primitive horse, the Eohippus, Orohippus and Epihippus. In 1890-99 he made researches in the geology of the region between the Appalachian range and the Atlantic. He was curator of the geological collection of the Yale Museum of Natural History in 1867–99, and in 1898 presented to the university his own collections. He was a nephew of George Peabody (qv.), and it is said to have been at his suggestion that the Peabody Museum at Yale was established. In 1887 he was made honorary curator of vertebrate palæontology in the United States National Museum, and in 1898 received the Cuvier medal of the French Academy of Sciences. He was president of the American Association for the Advancement of Science in 1878 and of the National Academy of Sciences in 1883–95. From a bibliography of 237 titles these works by him may be cited: 'Odontornithes: A Monograph of the Extinct Toothed Birds of North America' (1880); 'Dinocerata: A Monograph of an Extinct Order of Gigantic Mammals' (1884), and 'The Dinosaurs of North America' (1896) Consult memoir by C E Beecher in the American Journal of Science, June 1899.

MARSH, Sylvester, American engineer: b. Campton, N. H., 30 Sept. 1803; d. Concord, N. H., 30 Dec. 1884. In 1826 he established a provision business in Boston, in 1833 in Chicago and from 1837 was in the grain trade at Chicago. He originated the meat-packing industry and is regarded as one of the founders of Chicago. From 1864 he resided in New Hampshire. On 25 June 1858, he obtained a charter for a railway to the summit of Mount Washington, a project deemed so impossible that he was called "crazy Marsh." The railway, 2.81 miles long, with an ascent of 3,625 feet, was completed in July 1869. The chief feature in the operation of the road is a central cog-rail. The principle proved so practicable that literally hundreds of similar railways have been constructed on the sides of famous mountains all over the world.

MARSH CROCODILE, or MUGGER, the common inland crocodile of India, locally venerated by the Hindus, to whom it is known as "Mugger." It inhabits the tanks and marshes of India and Ceylon, and suitable places westward almost to the Persian coast and eastward throughout the Malay Peninsula and islands. It is dark, olive-brown in general color above, lighter on the ventral surface; the young are paler, with black spots A specimen 12 feet long is considered large, but instances of a length of 18 feet have been recorded The head is rough-coated, but has no ridges; the snout is broad and the teeth number 76. These crocodiles swarm in river-marshes, weedy ponds and artificial reservoirs, throughout their range, feeding on fish and small animals, and little feared by horses, cattle or human beings, for in general they are cowardly and reluctant to attack men or even to resist injury In case the water of their home dries away, they migrate to other pools, and in seasons of drought are likely to be met with anywhere wandering in search of water; as a last resort they will bury themselves in the mud and remain in torpor until revived by the coming of rains. These reptiles display considerable cunning in capturing their food and in avoiding harm, feigning death very cleverly. They are kept in a semi-domesticated condition in many parts of India by pious Hindus, whose priests build temples near the great ponds, protect and feed the reptiles and imagine the service pleasing to the gods as well as profitable to themselves. Extensive descriptions of the animal and of its worship may be found in the zoological works of Blanford, Jerdon, Tennent, Gadow and others and in such volumes as Adams, 'Wanderings of a Naturalist in India' (Edinburgh 1867) and Hornaday, 'Two Years in the Jungle' (New York 1885)

MARSH GAS. See METHANE MARSH HARE. See Hares.

MARSH HAWK, or HARRIER, a mi. gratory hawk (Circus cyaneus) of medium size. commonly known in one or another of its varieties throughout the north temperate zone. which frequents marshy meadows, where it makes its nest upon the ground in a tussock of grass, and lays five to seven roundish, dirty white eggs. In such places it finds its food, chiefly mice and frogs, and sails slowly back and forth close to the ground watching keenly for movements in the grass and ready to pounce upon its prey. Its wings are long and its flight may be swift and powerful when occasion demands, but it was accounted "ignoble" among falconers It rarely seizes birds or even young poultry, although one of its names is "hen-harrier," and should be protected and encouraged by farmers as one of the most useful and persistent mousers This hawk may be readily recognized by the broad patch of white on the rump displayed by both sexes. male is dull grayish-blue, in general tint, and the female rusty brown, both streaked with white. The American harrier (C. hudsonus) is generally brown, though the adult males are blue-gray on the back; the tail-coverts are white Consult Coues, 'Birds of the Northwest³ (1874).

MARSH-HEN. See MUD-HEN.

MARSH MALLOW, a coarse, large leaved herb (Althea officinalis), of the Old World, but naturalized in marshy places along the eastern coast of the United States, which is related to the hollyhocks (qv.); the flowers are pale rose-color, some in a terminal spike and some axillary. Its root is mucilaginous and of service as a demulcent in medicine, but it is mainly used as a basis for the confection called "marsh mallow." See Mallow.

MARSH-MARIGOLD. See COWSLIP

MARSH-WREN, either of two species of American wrens that inhabit reedy marshes. They have the diminutive brown bodies, short wings and tails, the latter often held cocked up over the back, awl-like bills and inquisitive activity characteristic of wren (q.v.) generally. One is the long-billed (Cistothorus palustris), most numerous in the salt-marshes along the Atlantic coast; and the other the short-billed, better known about inland lakes and rivers. The former is somewhat the larger, has a decidedly longer bill and lays eggs dark chocolate in color, while the eggs of the short-billed species are pure white. Both make elaborate nests in the form of ball-like baskets, with a little entrance at the side, woven of leaves of wild rice or marsh grasses and fastened to the stems of the reeds. A curious habit of the species is that each pair will make several nests

each season, only one of which serves the purposes of incubation. These wrens give in the spring an exceedingly pretty clattering song and when dozens are singing together in a patch of reeds the effect is most pleasing.

MARSHAL, a federal officer appointed by the president in each judicial district and cor-responding to the sheriff of a county. His duty is to execute all precepts directed to him, issued under the authority of the United States, and is under the jurisdiction of the United States District and Circuit courts. The United States government maintains marshals in its principal dependencies, as the Philippines, Alaska, Puerto Rico, Hawaii, etc They are appointed by the president for four years, and in addition to serving the courts have certain duties regarding internal revenue, public lands and the postal service Sometimes the chief of police in American towns is known as marshal. In some European countries the title of marshal confers the highest military distinction, that of marshal of France being especially prized. The word is france being especially prized. The word is derived from the Old High German word marah, a horse; and scalh, a servant; hence Marascalh, a man appointed to take care of horses. The marshal of the German Empire derived his origin from the Frankish monarchs and was equivalent to the comes stabuli or connétable He was bound to keep order at the coronation of the emperor, and to provide lodgings for the persons connected with the ceremony He was called arch-marshal, a dignity belonging to the electorate of Saxony At the coronation it was his duty to bring oats in a silver vessel from a heap in the open marketplace, and to present the vessel to the emperor. His duties were discharged by a hereditary marshal (*Erbmarschall*). In Prussia general field marshal is the highest military honor In England field marshal is given as an honorary rank to general officers who may have no immediate command Marshal also signifies a person who regulates the ceremonies of certain solemn celebrations or, as in the United States, at parades, street processions, and the like.

MARSHALL, mär'shal, Alfred, English economist b. London, July 26, 1842; d. July 13, 1924. He was educated at Saint John's College, Cambridge, and in 1877 was principal of University College, Bristol. In 1883–84 he was lecturer at Balliol College, Oxford, from 1885–1908 he was professor of political economy at Cambridge, and a member of the Royal Commission on Labor in 1891. He published Economics of Industry (1879); Principles of Economics (1890); Elements of Economics (1891); Fiscal Policy of International Trade (1903).

MARSHALL, Frank James, American chess master b. Brooklyn, N.Y., 1877. He acquired fame when a boy by winning the championship of the famous Brooklyn Chess Club Next he took the championship of the Manhattan Chess Club. Thereafter he became a professional player and entered in most of the international tournaments. In 1905 he won the International Chess Tourney at Cambridge and challenged Lasker for the world's championship, but was defeated. In all he won first prize in seven international tourneys. He won the Pan-American championship by defeating

Capablanca in Cuba in 1912. In the years following he played with varying success. He succeeded Showalter as United States champion.

MARSHALL, George Catlett, American chief of staff, diplomat, and secretary of state: b. Uniontown, Pa, Dec. 31, 1880. Being the son of a Kentucky Democrat in a Republican state, West Point was apparently denied, so he left Uniontown to attend Virginia Military Institute He stood number 35 in the freshman class and at that early age showed his character. class and at that early age showed his character by not revealing the identity of the sophomore who bayoneted him during an interclass conflict. He began drill in the awkward squad He grew in stature and in the favor of his classmates, attaining 15th place in the class and becoming senior officer and first captain. Late in his college career, with high cadet ranking already assured, he decided to go out for football. His play was so brilliant that he was selected all-Southern tackle in 1900. While at V.M.I he scoured the Civil War battlefields, 1901 he was the battle details. Graduating in 1901, he was recommended for and accepted commission as a second lieutenant of infantry In 1907 he became a first lieutenant and was an honor graduate of the Infantry-Cavalry School. He was graduated from the Army Staff College at Leavenworth in 1908, attaining such phenomenal grades that he was there, as a lieutenant, appointed instructor with captains and majors in his classes, a very unusual procedure at that tıme

In 1913 he was a lieutenant in the Philippines The chief of staff of the "defending" forces fell ill. The lieutenant was called upon. He questioned the regimental commander and ordered an attack, dictating the plan of battle without making a single correction Maj. Gen J. Franklin Bell, the army's first chief of staff, in commending the lieutenant for this set of field orders, said that his work put generals to shame and that "he is the greatest military genius since Stonewall Jackson"

He became a captain in 1916 and in 1917, with a Moroccan division in France, won the Croix de Guerre and the Legion of Honor. By 1918 he had become a full colonel He was selected by General Pershing to be chief of operations of the First American Army under Gen. Hugh Drum. During this assignment, he completed the accredited cleanest piece of staff work of the First World War—the smooth transport without German knowledge of 500,000 men and 2,700 guns from St. Mihiel to the Argonne front in two weeks.

After the armistice, he reverted to captain and spent four years as military aide to General Pershing. He became a major in July 1920, a lieutenant colonel in 1923, a colonel in 1933, a brigadier general in 1936, and a full general as chief of staff on Sept. 1, 1939. He had been assistant chief of staff from July 6, 1938 to Oct. 15, 1938, deputy chief of staff from Oct. 16, 1938 to June 30, 1939, and became acting chief of staff on July 1, 1939. He was the second non-West Pointer to become chief of staff—Leonard Wood was the first. In becoming general in 1939, he was advanced over 34 higher officers—14 brigadier generals, and 20 major generals.

Under General Marshall, the army accomplished the smooth transition from skeleton square divisions and less than 200,000 men in

1930 to streamlined triangular divisions with 8,00,000 men of thak strength. Figure World War L. Profit to five-star mark, Dec 15, 1944 the certral's role littery copeared in his breinfal report, published Cottoler 1945, which summarized the American multiary effort. A month later he was succeeded as chief of staff by General Ersen ower.

In December 1945, he flew to China as the prospection's constant to mediate between the government.

In Decounter 1945, he flet, to China as the prosident's envisary to mediate between the government of Criang Kai-shek and the Communists. His efforts, continuing for a year, proved

unsuccessful

The general's appointment as secretary of state on Jan. 7, 1947 was popular in view of the sharpening international tension. After a tour of European capitals in March, he strongly supported the Truman program of aid to Greece and Turkey. His Harvard Commencement speech of June 5 called on the European nations to confer and decide on their needs so that United States aid could be integrated. This so-called Marshall plan resulted in the 16-nation European Cooperation Conference which met at Paris from July to September to plan Europe's rehabilitation against bitter opposition of Russia and her eight satellites.

MARSHALL, Henry Rutgers, American author: b New York, 22 July 1852, d there, 3 May 1927. Besides contributions to literary, philosophical and psychological periodicals he wrote Pain, Pleasure and Aesthetics (1894); Aesthetic Principles (1895): Instinct and Reason (1898); Consciousness (1909), and War and the Ideal of Gene (1915); Mind and Conduct (New York 1919); The Beautiful (1924).

MARSHALL, Humphrey, American botanist: b. West Bradford (the present Marshallton), Pa., 10 Oct. 1722; d there, 5 Nov. 1801. He followed the stonemason's trade, but devoted his leisure to astronomy, building a small private observatory, and to natural history. He began the collection and cultivation of the more interesting indigenous plants, and in 1773 established the Marshallton botanical garden, where were assembled trees and herbaceous plants of the United States. For years he was treasurer of Chester County, Pa., and in 1786 he was elected to the American Philosophical Society. His Arboretum Americanum, described as «an Alphabetical Catalogue of Forest Trees and Shrubs, Natives of the American United States» (1785), was translated into several European languages.

MARSHALL, Humphrey, American politician: b. Westmoreland County, Va., 1756; d. near Frankfort, Ky., 1 July 1841. He joined the Continental Army at the outbreak of the Revolution, became captain of Virginia cavalry (1778), in 1780 established himself on a Kentucky plantation, opposed the separation of Kentucky from Virginia, and as a delegate to the Danville Convention of 1787 was prominent in defeating the measure. He was also a delegate to the Virginia Convention that ratified the Constitution of the United States, and in 1793 was a representative from Woodford County in the Kentucky legislature, where he declared his opposition to the plans for raising in Kentucky troops under Gen. George Rogers Clark for an attack on the Spanish settlements near the mouth

of the Mississippi River. From 7 Dec. 1795 to 3 March 1801 he was a Federalist senator in the Congress of the United States, and in 1800 was active in denunciation of Aaron Burr. He represented Franklin County in the Kentucky legislature in 1807–09, and had a dispute with Henry Clay which resulted in a duel in which Clay received a slight wound He sat again for Franklin County in 1823 He published the first History of Kentucky (1812; rev ed., 1824)

MARSHALL, John, chief justice of the United States: b. Germantown (now Midland), Fauquier County, Va, 24 Sept 1755; d Philadelphia, 6 July 1835 He was the eldest son of Col Thomas Marshall of Westmoreland County, Va., a distinguished officer in the French War and in the War of Independence, and of Mary Keith, a member of the well-known Ran-dolph family. Thomas Marshall removed from Westmoreland County to Fauquier soon after his marriage; this community was sparsely settled. and the educational advantages which he could give his children were meagre, consequently he became their earliest teacher and succeeded in imbuing them with his own love of literature and of history. For two years John Marshall had, as tutor, James Thompson of Scotland and he was sent for one year to the academy of the Messrs Campbell of Westmoreland County, where James Monroe was also a pupil He had no college training except a few lectures on law and natural philosophy at William and Mary in 1779. He was always fond of field sports and excelled in running, leaping and quoit throwing. He loved the free natural life of the country, and his long tramps through the woods around his father's home, Oak Hill, together with his athletic exercises gave him great strength and agility. At 18 he began the study of law, but soon left his studies to enter the Revolutionary Army. He was active in endeavoring to enlist men for the service and helped to form and drill a company of volunteers. As a member of his father's regiment he took part in the battle of Great Bridge where he displayed signal valor. In 1776 he became a lieutenant in the 11th Virginia, and the next year was made captain. He served in Virginia, New Jersey, Pennsylvania and New York, always displaying great courage and valor and a cheerful acceptance of hardships and privations. This experience was of untold value to Marshall: it broadened his views and quickened his insight in governmental questions. As he says, he entered the army a Virginian and left it an American. In 1780 during a period of mulitary inactivity he attended a course of law lectures at William and Mary and in 1781, after leaving the army, was granted a license and began the practice of law in Fauquier County. The next year he was elected to the Virginia assembly, and shortly afterward was made a member of the executive council He served his state as legislator during eight sessions. In 1784, although he had then removed his residence to Richmond, he was again elected delegate from Fauquier County, and in 1787 served as member from the county of Henrico. When the city of Richmond was granted a representative in the legislature, Marshall had the honor of this office which he held from 1788 to 1791. He was also a member of the Federal Convention which met in 1788 to discuss the ratification of the Constitution of the United States,

and it was largely due to his convincing arguments that ratification was carried, as the question was hotly debated and the anti-Constitution party had able and determined representatives For several years he held no public office and devoted himself entirely to his extensive law practice, but in 1795 was again elected to the legislature. During this session he defended the unpopular "Jay Treaty" with England, and by his overwhelming arguments completely refuted the theory of his opponents that the executive has no power to negotiate a commercial treaty. Marshall's attitude during his service as legislator toward all questions concerning federal power demonstrated his increasing belief that a strong central government is necessary to real efficiency. In 1783 he had married Mary Ambler, daughter of Jacqueline Ambler, treasurer of the state, and soon after his marriage made his permanent home in Richmond. The honors bestowed on him testify to the esteem in which he was held by the state and by the nation. He refused the attorney-generalship and the ministry to France, but in 1797 accepted the office of special envoy to France with Charles Cotesworth Pinckney and Elbridge Gerry. This mission related to the indignities which the French had offered the American Navy and attempted to adjust the commercial relations between the two countries. It failed on account of the arrogant attitude of France, but "Marshall's dignified correspondence added greatly to the prestige of America," and on his return he was welcomed with many evidences of approbation from his grateful countrymen Yielding to the earnest solicitation of Washington he became a candidate for Congress and was elected a member of that body in 1798. In Congress he was the leader of the administration party and the greatest debater in the House on all constitutional matters In one of his most noted speeches he defended the action of President Adams in the case of Jonathan Robbins and proved conclusively that this case was a question of executive and not of judicial cognizance. In 1800 he was made secretary of state, and in 1801 appointed chief justice of the United States, which office he held until his death in 1835. In 1829 he, like ex-Presidents Madison and James Monroe, was a member of the Virginia convention which met to alter the state constitution, and by his wisdom and moderation did much to prevent radical changes and to thwart the attempts of politicians against the independence of the judiciary. In 1831 his health, hitherto unusually vigorous, began to fail; he underwent a severe surgical operation in Philadelphia and was seemingly restored, but the death of his wife was a great shock and a return of the disease in 1835 proved fatal. He died in Philadelphia, whither he had gone for medical relief, and was buried by the side of his wife in the New-Burying-Ground, now Shockhoe Hill Cemetery, Richmond. The sorrow over the country was deep and widespread; even his bitterest enemies mourned for the kindly, upright man.

Though somewhat ungainly, Marshall was always dignified in appearance; his tall, loosely jointed figure gave an impression of freedom, while his finely shaped head and strong, penetrating eyes bespoke intelligence and power. Directness and simplicity were his dominant characteristics. He was free from any display

of pomp, air of office or studied effect. His unfailing good humor, his benignity, his respect for women, his devotion to wife and family and his well-known reverence for religion made him loved and admired even by those who heartily disliked his political opinions. As chief justice for more than 30 years he rendered numerous decisions which were of prime importance to a nation in process of formation. The faculty nation in process of formation. The faculty which made Marshall invaluable as a jurist was his power of going directly to the core of any matter. No subtleties, no outside issue confused him, his analysis was unerring, his logic incontrovertible; he cared nothing for the graces of rhetoric and made no appeal to the emotions; his power lay in his deep conviction and in his illuminating and progressive argument. At a period when the powers of the Constitution were ill-defined, when our government was experimental, Marshall's decisions in constitutional and international cases were invaluable factors in forming a well-organized federal government. "He made the Constitution live, he imparted to it the breath of immortality, and its vigorous life at the present hour is due mainly to the wise interpretation he gave to its provisions during his long term of office." Marshall was the author of numerous reports and papers, of a history of the colonies and of a Life of George Washnigton, 5 vols. (1804-07), a book of small literary merit, but containing a mass of valuable authentic information Consult Beveridge, Albert J, Life of John Marshall, 4 vols (New York 1916-19); Palmer, Bradley W, Marshall and Taney, Statesmen of the Law (New York, 1920) 1939)

Emilie W McVea, Late President of Sweet Briar College.

MARSHALL, Louis, American lawyer: b. Syracuse, N Y., Dec. 14, 1856; d. Sept. 11, 1929. He was educated in the Syracuse public and high schools and at the law school of Columbia University In 1878 he began practice at Syracuse. He was a member of the firm of Guggenheimer, Untermeyer and Marshall. He argued many important causes in the higher courts, specializing especially in constitutional and corporation law Marshall was a member of the New York Constitutional conventions of 1890, 1894 and 1915; served on the commission appointed by Mayor Low, in 1902, to investigate East Side conditions; chairman of the State Immigration Commission appointed in 1908 by Charles Evans Hughes (q.v.), then governor, and counsel for William Sulzer in his impeachment trial. He was prominent in the movement for the abrogawas prominent in the movement to the adoga-tion of the treaty of 1832 with Russia. He was mediator in settling the cloakmakers' strike in 1910, and prepared the protocol of settlement. He took an active part in Jewish charitable work and was president of the American Jewish Relief Commission during and after the First World War Marshall was a trustee of Syracuse University 1910-29.

MARSHALL, Thomas Riley, 28th vice president of the United States: b. North Manchester, Ind., March 14, 1854; d. Washington, D.C., June 1, 1925. He was graduated from Wabash College in 1873, studied law and was admitted to the Indiana bar in 1875, practicing his profession at Columbia City. In 1908 he was elected governor of Indiana. His administration

was progressive, and several laws were sponsored by him, including an employers' liability law, an antigambling law and direct nomination of senators. In 1912 he was chosen by the Democratic National Convention at Baltimore as the candidate of the Democratic Party for vice president of the United States. He was a consistent supporter of the Wilson administration, and in 1916 was again nominated and elected vice president. Some of his public utterances in 1913, in which he appeared to advocate radical ideas in regard to the inheritance of property, caused much criticism. He published his Recollections (1925). Consult Thomas, C. M., Life of Thomas Riley Marshall (New York 1940).

MARSHALL, William Louis, American soldier: b. Washington, Ky., June 11, 1846; d. July 2, 1920. He studied at Kenyon College in 1859-61; served in the Union Army in 1862-63; and in 1868 was graduated at the United States Military Academy. He was promoted through the grades, reaching that of brigadier general, chief of engineers of the United States Army, July 2, 1908. In 1870-71 he was acting assistant professor of natural and experimental philosophy at West Point; and from 1872 to 1876 had charge of the Colorado section of the explorations west of the 100th meridian. He discovered Marshall Pass over the Rockies in 1873, also gold placers of Marshall Basin, San Miguel River, Colo., in 1875. In 1881-84 he was in charge of the construction of levees in Mississippi, Louisiana and Arkansas; and improvement of the Mississippi River, of harbors on Lake Michigan in 1884–1900. He also superintended the construction of the Hennepin Canal 1890– 1900, and subsequently was engineer in charge of the construction of fortifications at eastern and western entrances to New York harbor. He constructed the 40-foot Ambrose Channel entrance to New York harbor. As chief of engineers he had charge of river, harbor and fortification works of the United States from 1908 to 1910. In 1914-15 he was responsible for protection of the Imperial Valley, Calif., against the overflow of the Colorado River.

MARSHALL, Ill., city and Clark County seat; alt 606 feet; 53m. S. of Danville; on the Big Four, and the Pennsylvania railroads. Its industries are oil refining, rock crushing, cheesemaking, and the manufacture of paint. It was named for Chief Justice John Marshall (q.v.). Pop. (1930) 2,368; (1940) 2,758.

MARSHALL, Mich., city and Calhoun County seat; alt. 1,000 feet; on the Kalamazoo River, and on the Michigan Central Railroad; 106m. W. of Detroit. It has an airport. The surrounding area is agricultural; the city is industrial. Its factories make automobile accessories, heating and refrigeration equipment, medicines, and medical supplies. Meat packing and processing of dairy products are additional industries. The city has a public library. Founded and incorporated as a village in 1830, Marshall became a city in 1858. It has mayor and council. Pop. (1930) 5,019; (1940) 5,253.

MARSHALL, Minn., city, Lyon County seat; alt. 1,165 feet, on the Redwood River, the Great Northern and the Chicago and North Western railroads, 160m. SW. of Minneapolis.

It is in farm country, and engages in the processing of foods. It was settled in 1870, incorporated as a village in 1875, and as a city in 1901. It has a mayor and council, and the water, power, and light systems are publicly owned. Pop. (1930) 3,250, (1940) 4,590.

MARSHALL, Mo., city and Salme County seat, alt. 779 feet; on the Missouri Pacific, and the Alton railroads; 84m. E. of Kansas City It is the trading center for a predominantly agricultural region raising grain, fruits, soybeans, cattle, and sheep. In the city are bottling, milling, and milk processing plants, a hide and wool market, and cold storage plants; shoes and culvert pipe are the principal factory products. Marshall is the seat of Missouri Valley College (q.v.); of the state school for feebleminded persons and epileptics, and of homes for crippled children and aged women. A fund is maintained here for the care of underprivileged children. Marshall was settled in 1836; named by the county court, in 1839, for John Marshall (q.v.), chief justice of the United States Supreme Court; and incorporated in 1866. It has mayor and council, and the water and electric lighting systems are city-owned. Pop. (1940) 8,533.

MARSHALL, Texas, city and Harrison County seat; alt. 375 feet, in direct lines 20m W. from the Louisiana boundary; 15m N of the Sabine River; 40m. W. of Shreveport, La.; and 67m. S. of Texarkana. It is on the Texas and Pacific Railway, on state and federal highways, and has a city airport. Located in the midst of a fertile agricultural region, Marshall has considerable industrial activity in addition to farming and dairying. Exploited timber lands have been turned into orchards, and some areas have been converted into prosperous stock-raising establishments. Although the lumbering operations of earlier days have been reduced as reserves of timber diminished, the second growth of pine is used in making wood pulp. Boxes and baskets are also manufactured for use in trade. Oil and gas, lignite, clays, and glass sands have been found near by, and have fostered development of industries. Marshall has busy railroad shops of the Texas and Pacific and a car-wheel and foundry plant; also cotton compresses, brick and tile yards. Marshall has commission government, with a city manager. The water supply is drawn from artesian wells. The Harrison county jail is located here. Marshall has two junior colleges, the College of Marshall (q.v.) and St. Mary's Academy, a Roman Catholic coeducational institution, and two coeducational colleges for Negroes, Bishop College, founded in 1881 by the American Baptist Home Mission Society, and Wiley College (q.v.), founded in 1873 by the Methodist Episcopal Church. The city has an excellent public school system. Marshall's site was first settled in 1842; the town was incorporated in 1842; the town was incorporated in 1842; the town was incorporated in 1843, the city in 1848. Although always a Texas town, Marshall was, in the Civil War, to all intents and purposes the capital of Missouri. Governor Claiborne F. Jackson had removed the administrative staff to Little Rock, Ark., and he died there in December of 1862. Lieutenant Governor Reynolds, succeeding him, moved the establishment to Marshall. The Texas city played an important part in the administration of the Confederacy. The ordnance, quartermaster, and commissary departments centered there. Large stores of military supplies were kept in the city. The Trans-Mississippi agency of the Confederate postal service had headquarters in Marshall. The city was named in honor of John Marshall (q v), chief justice of the Supreme Court of the United States. Marshall is in a health and pleasure resort section; Rosborough Springs is eight miles from the city, and Caddo, Highland, and Fern lakes near by. Pop. (1930) 16,203; (1940) 18,410.

MARSHALL, College of, Marshall, Texas. The College of Marshall was chartered Oct 22, 1912 by some citizens of the city of Marshall, whose purpose was to maintain an institution of Christian learning of collegiate grade. There should be 16 trustees, at least 10 of whom should be members of regular Baptist churches This charter was amended on Nov. 14, 1916, whereby the control and management of the college was transferred to the Baptist General Convention of Texas On June 4, 1917 the college opened with a summer session and summer normal. Its buildings consist of one three-story and basement administration building, two three-story brick dormitories, a dining hall, central heating plant and a magnificent campus of 55 acres. It is a junior college, with an annual student enrollment of about 275 persons, fairly evenly divided between men and women.

MARSHALL COLLEGE, a coeducational institution located at Huntington, W. Va It was founded in 1837 and opened the following year. James E. Morrow, father of United States Senator Dwight Whitney Morrow (qv.), was president of the college at the time of his son's birth. In 1939–40 the college reported an enrollment of 2,253 students—1,062 men and 1,191 women—a faculty of 111 members exclusive of administrative officers, a summer school enrollment of 1,072 students, and an income for the year of \$564,603. The grounds, buildings and equipment of the college were valued at \$3,997,000. The library contained 40,939 volumes.

MARSHALL ISLANDS, an archipelago in the western Pacific Ocean, north of the Equator. The islands are situated eastward of the Carolines and northward of the Gilbert Islands, and lie between 5° and 12° N. lat. and 165° and 171° W. long. They were annexed in 1885–86 by Germany, and after the First World War became a mandate of the League of Nations the mandate was assigned to Island when a ching the mandate was assigned to Island when a ching the mandate was assigned to Japan, whose activities on the archipelago remained largely veiled. The group consists of two parallel chains, about 700 miles in length, the Radak ("Sunrise") group of 18 islands in the east and the Ralik ("Sunset") group of 14 islands in the west, the chains being approximately 100 miles apart. The aggregate area of the islands is 160 square miles, and the population was reported to number 10,446 in 1935 Jabur, a small town on Jaluit (38 miles Jabur, a small town on Jaluit (38 miles long by 21 miles in breadth), an island of the Ralik group, is the administrative headquarters; Majuro, of the Radak group, is the most populous island, normally containing 1,600 inhabitants. Coconuts, sugar, and cotton are cultivated; breadfruit trees, pandanus, and taro also grow, as well as bananas and yams. The natives, who are Micronesians, are skilful in weaving mats and in the construction of large canoes.

In 1942-43 the islands enjoyed virtual im-

munity from American attacks, but on Jan. 31, 1944, United States forces struck at Kwajalein, Lae, and Namu atolls of the Ralik group, and within less than a week had completed their capture. In the same group, to the north and northwest, Eniwetok was captured on Feb. 18, Wotho on March 12, and Ujelang on April 25, 1944. No attempt was made to seize other of the Marshall Islands, though the Japanese garnsons on them were frequently bombed. It was estimated in February 1945 that by-passed Japanese troops on Wotje, Maloelap, and Mili, of the Radak group, and on Jaluit, totaled 12,000 to 14,000 men. Natives of Majure, Arne and Aur atolls in June petitioned the United States "to be our guardian and protector" after the war should end. The by-passed garrisons surrendered to American naval forces late in August.

MARSHALLTOWN, Iowa, city and Marshall County seat; alt. 863 feet; on the Chicago and North Western; Chicago Great Western; Minneapolis and St. Louis railroads, 58m NE. of Des Moines The Iowa River borders the city. Marshalltown is located in the heart of a great hog-and-hominy section, and meat packing is a leading industry. Minneapolis and St Louis Railroad shops are here, and there are foundries. Gaskets for automobiles, furnaces, and heating specialties are among the manufactured products. Pop. (1930) 17,373; (1940) 19,240.

MARSHALSEA, mär'shal-sē, a prison in London, attached to the Marshalsea Court, originally established under the earl-marshal of England for the trial of servants of the royal household Later it was used as a prison for debtors and defaulters, as well as persons convicted of piracy on the high seas. It stood near the church of Saint George, Southwark, and existed in the reign of Edward III It was abolished in 1849. The Marshalsea will be longest remembered as the home of "Little Dorrit" Charles Dickens' father was for some time an inmate of the Marshalsea, and in Little Dorrit the novelist gave a vivid picture of the life of a debtor and his family in this prison.

MARSHBUNKER, MARSBUNKER, Etc. See Moss-bunker

MARSHFIELD, Oreg., city in Coos County; alt. 19 feet; on the Southern Pacific Railroad, 245m. SW. of Portland. Situated on Coos Bay, Marshfield is a port of entry for the 29th customs district. Much lumber is shipped from here, and commercial fishing and the canning of sea foods are important items in Marshfield's industrial program Coal and black sands are mined near by The city has mayor and council. Pop. (1930) 5,287; (1940) 5,259.

MARSHFIELD, Wis., city in Wood County; alt. 1,288 feet; 185m. NW. of Milwaukee; on the Soo Line; and the Chicago and North Western Railroad. In the northern dairy belt, the city is a shipping point for milk products, including butter, cheese, and casein. Local industries center upon the manufacture of veneer panels and doors, shoes, steel tanks, culverts, vaults, springs and mattresses, beer, agricultural instruments, and apiary supplies.

instruments, and apiary supplies.

The present city is the second of two Marshfields. Originally settled in 1868 in the wake of

the railroad construction movement in the state, by 1887 it had become an immense sawmill community, with furniture factory, hub and stave factories, and boiler works. In that same year, fire leveled a greater portion of the town; and with the rebuilding of the second Marshfield, its industrial interests gradually shifted from lumbering to dairying and cheese-making. Incorporated as a town in 1875, Marshfield became a city in 1883 Municipal government is administered by a mayor and council. Pop. (1930) 8,778; (1940) 10,359.

MARSHMAN, Joshua, English Baptist missionary and Orientalist: b Westbury, Leigh, Wiltshire, 20 April 1768; d. Serampore, India, 5 Dec 1837. He was, like his father, a weaver, but had an insatiable thirst for learning and always kept a book on his loom. Thus he fitted himself to teach in a Baptist school in Bristol; and thence, in 1799, he went to Serampore as a Baptist missionary, and there founded, in 1810, a missionary college He was an able linguist, and published 'The Works of Confucius, containing the Original Text' (1809); 'Clavis Sinica' (1814); a Chinese version of the Bible, etc. He co-operated with Carey in the preparation of Telegu version of the Bible, a Bengali-English dictionary and a Sanskrit grammar. Consult Carey, 'Marshman and Ward' (1864).

MARSILEACEÆ, a natural order of acotyledonous plants, nearly allied to Lycopodiaceæ, but differing in the lack of a stem, and in the usually stalked leaves. The species all are inhabitants of ditches and pools, chiefly in temperate regions No species was known to be of any importance till the discovery of the Nardoo of Australia.

MARS-LA-TOUR, France, village in the department of Meurthe-et-Moselle, 15 miles west-southwest of Metz, on the road to Verdun. In the Franco-Prussian War of 1870-71 it was the scene of part of the battle of Gravelotte. The 38th German brigade was annihilated here.

MARSTON MOOR, England, in Yorkshire, is celebrated for the defeat there in 1644 of the royal forces numbering about 18,000 under Prince Rupert by the Parliamentary troops and Scots, totaling about 27,000 under Fairfax (Earl of Manchester) and Cromwell. Rupert escaped with only 6,000 followers into Lancashire and later rejoined King Charles. As a result, the whole north of England was left to the Parliamentary troops. Consult Kennedy, J. W., 'Scottish Borderers at Marston Moor, 1644' (1902).

MARSUPIAL FROG, any of several small tree frogs (Hyhdæ) of the South American genus Nototrema, which incubate their eggs in brood-pouches formed by infoldings of the skin on the back of the female. The eggs are few, of large size and abundantly provided with food-yolk, and the young sometimes remain in the pouches after hatching until they have completed their metamorphosis and attained considerable growth; but the species vary in this respect. In one case the opening is a longitudinal slit along the middle of the back, with a brood-pouch on each side; but in the other species the double pouch opens cross-ways, near the caudal extremity of the body and may be closed by a sphincter muscle. About half a dozen species

are catalogued, all natives of the forests of tropical America, and none is common or thoroughly well known Gadow ('Amphibia and Reptiles,' 1901) concedes that the best account of them is still that of Weinland in 'Archive fur Anatomie und Physiologie' for 1854

MARSUPIAL MOLE, a small burrowing marsupial of southern Australia (Notoryctes typhlops), called "urquamata" by the natives, which has a remarkable similarity to a true mole in appearance (except its reddish color), adaptations of structure to an underground life and habits. It feeds upon ants and other insects and often emerges and travels above ground, though the front feet have been so transformed into digging organs as to make them of little service for walking. It represents a family (Notoryctidæ) first described by Stirling in the 'Transactions' of the Royal Society of South Australia for 1891.

MARSUPIALIA, the maisupial mammals, a group ranked as an order, yet embracing the whole of the superior group Metatheria or Didelphia, as it has been variously named latest investigations, however, tend to invalidate the distinctions upon which these groups were formerly sharply separated from the higher mammals and to cause the marsupials to be regarded only as an order of Eutheria (qv), now distinguished chiefly by their extremely local distribution and degenerate non-placental type of reproduction. Their origin was extremely ancient and its sources are not known; but the group appears to have risen to Mesozoic times among the earliest of mammalian forms and to have begun, even before the advent of the Tertiary period, a course of special modification and degeneration, especially in the line which has survived to the present. The former belief that the marsupals stoom in the direct line of ancestry of mammals generally, which were thus considered as modified and diversified offshoots from the stock, is no longer held; on the contrary, the marsupials are regarded as a branch from some very early generalized stock, if not a group of independent origin. It is noteworthy, according to Woodward ('Vertebrate Palæontology, 1898), that the earliest known complete mammalian skeletons, which pass upward by insensible gradations into undoubted Euthema, are scarcely distinguishable from the skeletons of the more generalized existing marsupials (for example, Thylacmus). In the later Mesozoic Age the marsupials were apparently scattered over all the land-area of that time, as their remains have been discovered in many parts of both hemispheres; but even previous to the Eocene epoch they had disappeared entirely from north of the equator. From the first they are divisible into the two branches or suborders of Polyprotodonia and Diprotodonia. The former, characterized by appropriate small increase teath includes a majornumerous small incisor teeth, includes a majority of the most ancient forms and such modern groups as the opossums and desyures; while the latter, characterized by only abo six upper incisors and two, much enlarged, lower incisors, contain, besides some ancient forms, the majority of modern representations of the order, as the kangaroos, phalangers, wombats, etc

The marsupials take their name from the ventral pouch of skin, covering the mammary glands, in which the young are nourished or

protected in most families, and which is indicative of the peculiar method of reproduction characteristic of the order, and for the support of which two bones (the epipubic bones), not present in higher mammals, project forward from the pelvis The internal organs of reproduction are double, the two oviducts not uniting into a single uterus or vagina, although the separation of the two parts is often imperfect; hence the term Didelphia (qv) The testes of the male are suspended in a scrotum in front of the penis, the glans of which is often double. As a rule no allantoic placenta is present, but there is reason to suppose that the primitive marsupials were placental, and rudiments of this structure persist in the existing Australian bandicoots—a fact which invalidates the former prime distinction made between the marsupials and higher Eutheria

The young are dropped from the mother's womb as minute, undeveloped fœtuses, those of the largest kangaroos being not half as large as mice when born. These larvæ (for they are that) are then taken by the lips of the mother and placed, one by one, within her ventral pouch, where each is attached to one of her teats, where it clings by means of its temporary sucking-mouth and is nourished by the milk which oozes or is pressed down its throat. They remain there a length of time varying with the size of the species, until they have grown to an advanced stage of development, when they gradually emerge; but for a long time afterward return to the mother's pouch for refreshment, rest or safety when alarmed. The pouch varies in its capacity and completeness, in some families being quite absent, so that the young are shielded only by the long hair upon the mother's belly.

While this strange method of reproduction is the most prominent peculiarity of the marsupials, they differ from other orders of mammals in several anatomical features, such as the simplicity of the brain, in which the cerebellum is completely exposed, and the tendency to separation of bones of the skeleton, usually solidly

anchylosed in other mammals.

Since early Tertiary times marsupials have been confined to South America and the Australasian region, with the single exception of the few North American opossum (q.v). This family (Didelphyidæ) is restricted to the western hemisphere and alone remains of the large number of Tertiary forms once prevalent in South America, save a single Patagonian diprotodont, the opossum-rat (q.v). The home of the group, then, is Australia, Tasmania and the Payana group, when about 125 series are the Papuan group, where about 125 species are known; and the race seems to have survived in that insular region owing to the absence of destructive enemies, for most of them are almost defenseless vegetable feeders have, however, developed into a great variety of forms under the influence of varying conditions and long competitions, and present a most curious parallel to the diversities observable among the higher and more widely diffused mammalia Some have large size, go in herds and occupy grassy plains; others are smaller, more agile and confined to mountainous districts. Others are still smaller, burrow and feed upon roots or resemble little terrestrial rodents in appearance and habits; while many forms

dwell altogether in trees and often simulate squirrels of various kinds. In another direction have been evolved a variety of predatory marsupials, whose needs have developed bodies, teeth and powers resembling those of wolves or bears, and which are wholly flesh-eaters. There is, in fact, hardly a group of mammals which does not find a counterpart among the marsupials,—even the moles and shrews

The classification of the order divides it into 10 or 12 well-defined families, some of which

are wholly extinct, as follows:

FOLYPROTODONTIA:

Doubtful primitive forms,—Triconodon, Amphitherium, etc.

Didelphyidæ — Opossum (qv). Dasyuridæ.— Dasyures, Thylacines,

Dasyurida.— Dasyures, Thylacines, etc. (qq v).

Peramelidæ.— Bandicoots (q v.).

Notoryctidæ — Marsupial mole (q.v).

DIPROTODONTIA:

Epanorthudæ; Abderitidæ, etc — Fossil in the Miocene strata of Patagonia; but surviving in Cænolestes.

Phalangerida — Phalangers (q v).
Diprotodontida.— Extinct gigantic phalan-

Phascolomyidæ — Wombats (q.v.). Macropodidæ.— Kangaroos (qv.).

Consult Beddard, 'Mammalia' (1901); Thomas, 'British Museum Catalogue of Marsupialia' etc. (1888); Gould, 'Mammals of Australia' (1863); and scientific works on Australia, especially those of Waterhouse, Aflalo and Lydekker.

MARSYAS, mar'si-as, mythological son of Hyagnis and one of the Sileni of Asia Minor. Athena, having seen the reflection of herself in water, had thrown away the flute which she had invented, displeased because it disfigured the countenance in playing, and had pronounced the severest maledictions against any one who should take it up Marsyas accidentally found this instrument, on which he soon acquired such skill that he dared to challenge Apollo to a contest, the conditions of which were that the victor should do what he pleased with the vanquished The Muses, or according to others the Nysæans, were invited to be the umpires. The Muses decided in favor of Apollo, who put to death his rash competitor by binding him to a tree and flaving him alive. In this way was the curse of Athena accomplished Marsyas' statue was erected in several Roman cities as a symbol of liberty and other statues have been found illustrating his experiences, one by Praxiteles, which has been preserved in the Athens Museum.

MART, Texas, city in McLennan County; on the Missouri Pacific Railroad, 113m. SE. of Fort Worth. Situated in a cotton-growing region, the city's chief industry centers upon the processing of cotton. It is a railroad division point, and has car repair shops. First settled in 1885, Mart was incorporated in 1901. It has commission government. The water supply system is city-owned. Pop. (1930) 2,853; (1940) 2,856.

MARTA OF THE LOWLANDS (Terra baixa), the foremost achievement of the Catalan theatre, was written in Catalan by Angel Guimerá for Fernando Díaz de Mendoza and

María Guerrero and performed for the first time by these actors in the Spanish translation by José Echegaray It is the first Catalan work to obtain general currency beyond the limit of the provincial tongue During the present century no play has been more popular in the Spanish or Hispano-American countries, where it has maintained itself upon the stage without interruption since 1896, enlisting the talents of all the leading actors (Terra baixa) is predominantly social and human in appeal. This is its fundamental quality; but in equal degree it possesses high theatric effectiveness, which is not inferior to the host work of the which is not inferior to the best work of its period in this vein, whether produced in Spain or elsewhere. Simple feeling and torrential passion, in conjunction with sensitive insight and unusual grasp of significant situation, conyey an impression of elemental forces operating behind the broad effects of a carefully elaborated theatrical art, happily employed strictly in subservience to the theme. More than any other play, (Terra baixa) has contributed to fix the general conception of Iberian peasant drama which prevails in Europe and America A certain idealization may be noted in the rural characters, a reminiscence of the author's apprenticeship in the poetic drama. In objective realistic detail Guimerá is an unequivocal master. 'Terra baixa' has been translated into more than 20 languages. The English version by Wallace Gillpatrick (New York 1914) was acted successfully in England and the United States previous to publication. As 'Tiefland,' the play is favorably known in operatic form the play is favorably known in operatic form, with music by Eugène d'Albert.

JOHN GARRETT UNDERHILL

MARTEL, Charles. See Charles Martel.

MARTEL DE JANVILLE, Gabrielle, Comtesse de ("Gyp"), French author: b. Coetsal, Morbihan, 1850. She is a great grandniece of Mirabeau and at the age of 19 was married to Comte Martel de Janville. Her writings deal with types of Parisian life, of which Peti. Bob, Loulou and Paulette have become famous. Over 135 volumes in all have issued from her pen These include (Petit Bob) (1882); 'Autour du mariage' (1883); 'Un homme délicat' (1884); 'Elle et lui' (1885); 'Autour du divorce' (1886); 'Pour ne pas l'être?' (1887); 'Pauvres petites femmes' (1888); 'Bob au salon' (1888); 'Mademoiselle Eve' (1889); 'Bob à l'Exposition' (1889); 'L'Education d'un prince' (1890); 'Monsieur Fred' (1891), 'Mariage civil' (1892); 'Du haut en bas' (1893); 'Mariage de chiffon' (1894); 'Le cœur d'Ariane' (1895); 'Le pays des champs' (1902; 2d ed, 1910); 'Le pays des champs' (1902; 2d ed, 1910); 'Un ménage dernier cri' (1903); 'Maman' (1904; 2d ed., 1910); 'Le cœur de Pierrette' (1905); 'Ces bons Normands' (1907); 'La paix des champs' (1908); 'Joies d'amour' (1909); 'L'Amoureux de Line' (1910); 'La guingette' (1911); 'Le grand coup' (1912); 'Napoléonnette' (21st ed, 1913).

MARTELLO TOWERS, so called by corruption from *Mortella*, in Corsica, where a strong tower maintained a determined resistance to a superior English force in 1794. In consequence of the great strength exhibited by this

fort the British government erected a number of similar towers round the coast of Great Britain, and especially on the Kentish coast, as a defense against the threatened invasion from France They are circular, with walls of great thickness, and roofs bomb-proof, there are two stories, the lower for the reception of stores and the upper for the casement of troops. One traversing gun was mounted upon each, in working which the men were secured by the lofty parapet. The ordinary guard was from 6 to 12 men. With improved modern artillery Martello towers are useless, and in many places were dismantled, but some have received a new and more powerful armament, or have been adapted to the use of the coast guard, or revenue officers. In some instances they are rented to private individuals. Martello towers are still to be found in New Brunswick and Nova Scotia. There are also several on the Gulf of Mexico and one still remains at Kingston, Canada

MARTEN, the name of several fur-bearing animals of the weasel family (Mustehdæ) that are mainly arboreal in habits, and do not change their color to white in winter All inhabit the cooler parts of the Northern Hemisphere. The beech or stone marten (Mustela foina) is to be found in Europe generally south of the Baltic, although not now a native of Britain It is about 17 inches long in body, and its tail adds nine inches; its breast is white It is tractable, and is believed by some to be the animal domesticated by the ancient Greeks as a mouser pine, or sweet, marten (*M martes*) is rather smaller, but with a much longer tail, proportionally, and is more northerly in its distribution, occurring from the British Isles and Norway eastward to Siberia It has a finer, more valuable fur than the other, and a yellow throat. Very nearly allied to it in size, form and color is the Siberian sable-marten (M. zibellina), noted as furnishing in its coat the finest and most expensive of the furs from animals of this group The demand for this fur can be met only by the most difficult, and often dangerous, exertion in trapping and hunting in remote Asiatic forests; and it has resulted in a steady diminution of the supply and very high prices for the pelts. There is also a native marten in India and another in Japan. North America has two species of the genus—the American pine-marten, or Canadian sable (*M americana*), and the pekan (*M pennanti*) The former is hardly distinguishable from the sable of the Old World, and its fur, although regarded as somewhat inferior, is largely used garded as somewhat intend, is largely used as a substitute for genuine Siberian sable (See Fur-trade). The pekan is very distinct by its greater size (length, 24 inches, plus tail, 13 inches), its long and very dark coat and its decided by the decided of the further is of great velue. dog-like head. Its fur is of great value.

The body in all these martens is elongated and supple, with a long and somewhat bushy tail; the legs short and the toes separate and flexible, with long sharp claws adapted to the life in trees that most of them follow. They are fierce and cunning hunters, pouncing successfully on all sorts of small animals and birds, destroying birds' nets, catching frogs, and in winter pursuing and killing animals as large as hares and porcupines. The pekan, or fisher, is especially bold and voracious, but does not eat fishes in spite of its name. Both the

American species were formerly common in the mountainous parts of the eastern United States, but are now restricted to the remoter woods of Canada They make their dens, bedded with leaves and grass, in some high hollow of a tree-trunk, as a rule, but frequently choose a crevice among rocks, and there produce annually a litter of from one to seven young The period of gestation is about three months, and the young begin to leave the nest

when two months old

Breeding for Fur.— These bloodthirsty little carnivores are the very type of savagery, and

"the lattens are almost untamable. The high value of their fur (about 75,000 pelts of the sable, and 100,000 of the Canadian marten represented the market-supply just before the Great War) has caused much effort to be expended, especially in Canada, to breed them in confinement, but thus far the results have been small, although encouraging The general treatment and food seem to be like that for minks A large pen made of inch-mesh wire and floored with this, or in some way so prepared that the animal cannot dig out, should contain stumps and bushes to give the marten accustomed exercise Two males cannot be put together. When the female is ready for a mate she is placed in his cage, or vice-versa, and the mating will take place at night, so that the pair must usually be left together several days Mating occurs naturally in January or February. When the young are about two months old they may be removed from the mother, and should be brought up by hand, if possible, so as to become more gentle. These general directions apply to the pekan, but his quarters should be larger than for the sable.

Consult, besides general natural histories, Coues, 'Fur-bearing Animals' (Washington 1877); Ingersoll, 'Life of Mammals' (New York 1909); Seton, 'Northern Mammals' (New York 1909); Jones, 'Fur-Farming in Canada' (Montreal 1913); 'Canada Year Book.'

MARTENSITE, a constituent of steel, existing at a high temperature, and which being retained by sudden cooling, confers hardness upon the steel.

MARTHA'S VINEYARD, Mass., an island off the butt of Cape Cod, constituting, with the Elizabeth Islands, the County of Dukes. It is separated from the mainland by Buzzard's Bay, the Elizabeth Islands, and Vineyard Sound. New Bedford, with which it has steamship connections, is 20m. distant; Boston, 80m. by water. The island is 21 miles long and 10 miles across at its widest part. The largest towns on the island are Vineyard Haven, Oak Bluffs, and Edgartown, the county seat. The northern coast is high and rocky, rising to 308 feet. The southern coast is low and irregular, with sand bars and inlets. At Gay Head is one of the island's several lighthouses and a Coast Guard station. The island, once the site of annual camp meetings, is a popular summer resort. It was discovered and named by Bartholomew Gosnold in 1602. It was a part of the original New York Grant until 1692. The Indians who then occupied the place were quiet and friendly; they professed conversion to Christianity. They remained loyal to the whites even during King Philip's War. Pop. of Dukes County (1930) 4,953; (1940) 5,669.

MARTI, José Julián, ho-sā' hou-lē-an' mar'tē, Cuban author and patriot: b Havana, 28 Jan 1853; d Dos Rios, Cuba, 19 May 1895 He studied in Havana, was sent to the quarries while only a boy as a political suspect, then went to Spain, where in Madrid and Saragossa he studied for the bar and made himself famous for his liberal views, and on his return to America was professor in the University of Guatemala, whence he came to New York City as consul for Uruguay, Paraguay and Argentina. In 1894 he attempted to land armed men in Cuba, but was intercepted in Florida; in the next year he succeeded in landing, joined Gomez and was killed in a skirmish with the Spanish at Dos Rios Marti founded the Cuban organ of independence in New York City, La Patria He was a poet, and wrote a Spanish translation of Helen Hunt Jackson's 'Ramona' (1888).

MARTIAL, mar'chi-al (Marcus Valerius MARTIALIS), the world's greatest early writer of epigrammatic poetry, was born in Bilbilis, Spain, 1 March of one of the years 39 to 41 AD., and died probably between 102 and 104 AD. Like his literary friends, the Senecas, Lucan and Quintilian, who also were of Spanish birth, Martial in his writings was thoroughly Roman, and indeed has left us our most valuable picture of contemporary Rome. A Fronto and Flacilla, whom he mentions, may have been his parents, but we know nothing of their origin or station The grammatical and rhetorical training which his parents secured for him perhaps at Tarraco or Corduba, he half-seriously disparaged as being of no financial advantage, but it was really to his pen that he owed, at least indirectly, his support through life For, although he was apparently fully equipped for practice at the bar, the profession of an advocate was too exacting to be attractive On his arrival in Rome, perhaps in 64 AD, powerful friends launched him on a literary career which rapidly carried his fame even to the limits of the empire. But success as a poet brought him no contentment, since in return for the money, food, clothing, etc., which by flattery and begging he got from imperial courtiers and other men and women of wealth, he had daily to perform social duties that were highly irksome to his indolent nature. From the patron's reception at dawn to the end of the latest dinner, he had to dance attendance with wit that should never fail. We find him living at first in humble lodgings on the Quirinal, later in a house of his own on the same hill. A barren farm near Nomentum was his usual refuge from the cares and noises of the capital, but he sometimes made long journeys in Italy, often visiting the country houses of his friends To his poetical and social talents he also owed political favors from Titus and Domitian. A tribuneship gave him membership in the equestrian order, but probably not the fortune of a knight. He likewise received the coveted privileges to which a father of three children was entitled, the ius trium liberorum, though unearned; for the references that have given rise to the theories that he was married from one to three times are not of personal application. It is probable that even Marcella was no more than his patroness When disgust at the client's life in Rome led him in 98 to return to Bilbilis, this Spanish lady gave him a fine estate. A longing soon seized

him, however, to be back in Rome with all its inspirations, a longing never to be gratified; Pliny the Younger, who had helped Martial with a gift of money on his departure from Rome, records the poet's death in Spain. Besides those already named, Juvenal and Silius Italicus should be mentioned as Martial's friends. Noteworthy among contemporaries whose names do not appear in his poems are Tacitus and Statius The former could have had little sympathy with his character, the latter was no doubt his rival in literary mendicancy. We have 1,575 of Martial's poems. More than half of these are of four lines or less. His earliest book published in 80 contains epigrams describing shows given by the emperor. Then describing shows given by the emperor Then followed books XIII and XIV made up of twoline inscriptions for presents at the Sarurnalia The other books (I-XII), containing many poems which we should not call epigrams at all, appeared at varying intervals in the period 85-101. Martial's influence in his chosen field has never ceased. A remarkable number of the best epigrams in modern languages are merely adaptations or translations of his poems. His personal character has received general condemnation. Obscenity and servile flattery are the main charges. But in judging even the in-sincere language that he uses in speaking of the tyrant Domitian we must remember that it went only a step beyond the requirements of formal court etiquette. Kindly critics find in Martial some good points, his modest valuation of his own work, his freedom from envy, his scorn of all hypocrisy, his steady resistance to all temptations to use his powerful weapon of satire in either an unjust or unkind spirit, his tender love of children, humane treatment of slayes and above all his deeply affectionate attachment to his friends See EPIGRAM.

Bibliography.—The best text edition of his poems is that of W. M. Lindsay, Oxford, Clarendon Press. The German annotated edition of Friedlaender is invaluable. The only complete translation in English, is in the Bohn series.

translation in English, is in the Bohn series.
Walton Brooks McDaniel,
Professor of Latin, University of Pennsylvania

MARTIAL LAW, government by arbitrary military power; that supersedes municipal law, or State law, yet is not a military law. When in time of extreme peril to the State, either from without or from within, the general safety cannot be trusted to the ordinary administra-tion, or the public welfare demands the adoption and execution of extraordinary measures, it may become necessary to declare the existence of martial law. This is, indeed, no law at all in its ordinary sense; it is in fact the abrogation of it. That which is done under martial law has not an immediate constitutional or legislative sanction, as the military or the statute law, for example, has Yet remotely and indirectly martial law expresses the will of the people The Supreme Court of the United States has held that a State legislature may proclaim its existence whenever the public safety demands it; and the Constitution, by implication at least, also permits its proclamation by that clause which provides that the privileges of the writ of habeas corpus shall not be suspended, unless when, in cases of rebellion or invasion, their suspension is essential to the general welfare. See also LAW, MILITARY; MILITARY COURTS AND COURT-MARTIAL.

MARTIAL'S EPIGRAMS. Marcus Valerius Martialis, the epigrammatist, was born about 40 Ap in Bilbilis, Spain, 20 miles west of the present Aragonese city of Saragossa. He went to Rome at the age of 23, and after nearly two score years of residence at he capital returned to his native town, where he died about At the age of 40 he celebrated the dedication of the Coliseum and won the favor of the Emperor Titus by composing the 'Book of Spectacles, a collection of epigrams on the incidents of the day's sport. Several years later he published two collections of couplets to be used with dinner favors and with presents at the Saturnalia, which afterward took their places in his works as books XIII and XIV Books I to XII, his really characteristic work, were published at intervals more or less regular from 86 to 102, the last one having been sent from Spain after his return The total number of pieces in the 15 books is about 1,550, of which three-fourths are in the elegiac couplet, like the verse of Ovid and the great part of Greek epigram.

Though at first glance Martial seems to continue the tradition of the epigram, which had already had long life and great fame in the Greek tongue, he is really to a large extent original and creative, and is of the greatest importance in literary history as being the founder of the epigram as it has been popularly conceived ever since; that is, as a short, highly concentrated poem with a point that is made to appear suddenly or with a surprise.

"Chloë weeps with one eye. Do you ask how it's done? The answer is easy she has only one" (Dimsdale.)

Whether his influence has been the best is sometimes questioned. Those who are familiar with the calm, sunny, contemplative, tripping genius of the Greek Anthology, which, though its epigrams are always neat and concise, and sometimes stinging, has not as a whole the satiric character, will be likely to think Martial somewhat hard and metallic in both form and content Those who enjoy "verbal exactness and mechanical ingenuity" (Dimsdale), and look to the epigram for the character of stinging, satiric pointedness usually associated with it, will agree with Lessing that he is the world's greatest epigrammatist, and understand his appeal to Dryden, Pope and Johnson

Martial is not all pungency A not inconsiderable number of his pieces are epigrammatic rather than epigrams; a few of them might be classed as short poems without reference to epigram. They are nevertheless homogeneous Even more than perfection of form, the characteristic that gives them all a unity, is their quality as a human document Martial was right when he said, "My page smacks of human life." Provincially and simply bred, pursuing the existence of a free lance in a great capital in an intense age, gifted with a keen understanding, a quick eye, and a responsive pen, he converted into clear, cameolike literary pictures for the amusement of his own time, and for the amusement and instruction of all time, innumerable vivid impressions from the fascinating realities among which he moved To read his epigrams in quantity is like sitting before a cinematograph of the Flavian era. There flash before us lively scenes

of men and things numerous faces of the known and the nameless, types of men and women from every sphere, the bawling schoolmaster with his noisy pupils, the poetical bore reciting his verses to unwilling ears, the stingy host, the snowstorm in the amphitheaire, the routine of the Roman day, the patron who is never at home, the guest who comes too early. the transparent hypocrite, the slow barber, the waste slopes of recently active Vesuvius, the incident of the circus or theatre or the dinner or the street In an age of ennu, the world is fresh and interesting to Martial Not only men, but things, find him attentive. Thinking of this and of his facility of expression, Verrall says ('Literary Essays, Classical and Modern,' p. 15) that he is "perhaps the only writer in whom plate and tapestry, earthenware and hardware, beds and sofas, become truly poetic" Dimsdale ('Latin Lit,') p 472), commenting on his method of attaining vividness by the use of realistic detail, says that "he uses no general expressions such as 11ch and poor, but speaks in terms of jewelry, scents, linen, cloaks and boots.

Martial is a satirist, but only by accident. He has no moral indignation such as a few years afterward glows from the page of Juvenal. "A certain intolerance of hypocrisy," says Mackail ('Latin Lit,' p 194), is the nearest approach Martial ever makes to moral feeling He does not scold, he does not even preach. He manifests no moral enthusiasms, and almost no malice for anything. He is a wit rather than a humorist, though he is by no means without humor. He merely records, and his quality as a satirist is the outgrowth and accompaniment of epigrammatic expression rather than the result of conscious purpose. To portray freely and realistically was in itself to satirize.

The reader's enjoyment of Martial unexpurgated is interfered with by coarseness in about one in 10 of his pieces. This is hardly higher or lower than the modern European average, though his coarseness is not on this account the more welcome. He is also charged with servility in his attitude toward the emperor and other patrons It should be said in extenuation that literary patronage has until not long ago been a regular and a recognized relation and has always carried with it a certain amount of purely conventional flattery, and that Martial's servility perhaps did not seem so offensive in his own day as it does now, when the servility of the literary art finds expression in other ways. So clean-hearted and cleanlipped a man as the younger Pliny, in expressing regret at the poet's death, has left the word candor as descriptive of him . "he was a man of talent, penetrating, keen, with exceeding wit and satire as a writer, and with no less candor." This is probably a reference to the sincerity and frank straightforwardness of Martial the realist, who saw clearly and took no pains to cover up either other men's failings or his own. Of himself he says, "My page is free, my life upright." Of his work he says:

"Good, fair, and bad
May here be had
That's no surprise!
Twere vain to look
For any book
That's otherwise."
(Kirby Smith.)

Lovers of Spanish art in general, and of the present day novel in particular, will find themselves wondering whether Martial is not to be explained as merely an ancient example of the truthfulness and directness which so strongly characterize the Spanish genius Paul Nixon, in "A Roman Wit," gives a spirited rendering, inevitably lacking in finish, of about 200 epigrams. The Bohn Library Martial contains a greater number of translations in both verse and prose Kirby Smith, in the Sewanee Review, Vol. 26, No. 1, may be consulted for appreciation.

GRANT SHOWERMAN

MARTIN, Saint, of Tours: b. about 316; d. about 400. He attended the catechetical school at Pavia. His father was a military tribune, and compelled him in his loth year to take up arms. He is said to have early escaped from his father and received instruction in a Christian church He served under Constantius and Julian, and went to Gaul, where he appeared as the model of all virtue. Among other acts he divided his cloak with a poor man whom he met at the gates of Amiens (Ambianum). The legend says that Christ appeared to him in the following night covered with the half of this cloak Soon after this vision Martin was baptized, in 337. After living many years in retirement he made a visit to his native place, during which he converted his mother, and opposed with zeal the Arians who prevailed in Illyria. For this he was scourged from the country, on which occasion he manifested the firmness of a martyr. He now established a monastery in Milan, but when he found himself again exposed to persecution took refuge on the island of Gallinaria, in the Ligurian Sea. He next settled at Poitiers, where he assembled a number of monks, and is said to have wrought many miracles. In the year 375 (according to others 371 or 374) the bishopric of Tours was conferred on him against his will In order to withdraw himself from the world he built the famous convent of Marmontiers, between the river Loire and a steep rock. This is regarded as the oldest abbey of France.

MARTIN, the name of five popes of the Catholic Church, as follows:

MARTIN I, Saint: b. Todi, Tuscany; d. Chersan, Crimea, 16 Sept. 655. He was elected Pope in 649, succeeding Theodore I. He summoned the first Lateran Council at which he caused the doctrine of two wills and operations in Christ to be affirmed. The Emperor Constans II upholding the doctrine which the Council had condemned, took the Pope prisoner and brought him to Constantinople on a charge of treason and then banished him to the Crimea. On account of his sufferings he is numbered among the saints. His day is 12 November.

MARTIN II, or MARINUS I: b. Montefiascone; d Rome, 14 Feb. 884 He was elected Pope in 882 after the death of John VIII. While bishop of Caere he had been legate for three popes in their negotiations with the East. To English King Alfred he sent a piece of the wood of the cross.

MARTIN III, or MARINUS II: b Rome; d. 946. He succeeded Stephen VII in 942 and was greatly esteemed for his learning and, nobility of character.

MARTIN IV (SIMON DE BRION, SE-MOÑ de brê-ôn): b. France; d. Perugia, 28 March 1285. He succeeded Nicholas III in 1281, having previously been canon of Tours, and cardinal from 1262. He owed his election in great measure to the influence of Charles of Anjou, whom he supported thereafter and did all in his power to enable that monarch to retain possession of Sicily. In his pontificate occurred the massacre known as "The Sicilian Vespers"

MARTIN V (ODDONE COLONNA, ŏt-tō'nā kō-lōn'na): b. Rome, 1368; d. there, 20 Feb 1431. He was elected Pope in 1417, after the abdication of Gregory XII, and the deposition of John XXIII and Benedict XIII, during the Council of Constance. His first act was to promulgate a bull against the Hussites, remarkable from the circumstance that in it the Pope seems to recognize the supreme authority of the councils. He was one of the ablest of the popes, and through his efforts unity was finally secured to the Church and peace to Italy In 1418 he dissolved the Council of Constance, though a number of difficulties were not then adjusted, and dissensions continued in the Church. Benedict XIII still lived; and at his death, in 1424, a new anti-pope was elected in Clement VIII, who renounced his pretensions in 1429, when he received the bishopric of Minorca as an indemnification.

MARTIN, Alexander Carson, American missionary and educator: b. Livonia, Ind., 10 April 1827; d. Peking, China, 18 Dec. 1916 He was educated at the University of Indiana, from which he was graduated in 1846. He later studied at the New Albany Theological Seminary (now the McCormick Theological Seminary), at Chicago, from which he was graduated in 1847. The New York University conferred the degrees of D.D. and LL.D. upon him.

He was appointed a Presbyterian missionary to China in 1849 and left here on 23 November of that year for Canton. For 67 years he worked among the Chinese. It was said of him that probably he knew China and the Chinese language as did no other American. Dr. Martin retired from active missionary work in 1868 to enter the Chinese government service. He was named by the Board of Foreign Missions here as an honorary missionary. He acted as interpreter for the United States Minister to China in the negotiations between the Washington government and the Imperial Government, at Peking, in connection with the United States-Chinese treaty of 1853. He was the organizer and president of the International Law and Language School in Peking which was destroyed in the Boxer rebellion in 1900. He was said to have been the first Western teacher to open the door of English learning to the youth of the Far East. After 30 years as adviser to the Chinese government, Dr. Martin became presi-dent of the new Imperial University of China. This movement for the establishment of a great institution of learning there was blighted by the Boxer uprising. Later Dr. Martin took the period of three years. He retired from this work in 1905. In the same year, when he was 78 years old, he gave up teaching, but remained in the capacity of adviser for both the govern-ment and the Presbyterian mission.

MARTIN, Bradley, American banker, brother of Frederick Townsend Martin: b Albany, N. Y., 1841; d. 1913 In 1863 he was graduated at Union University, Schenectady, N. Y. He served in the National Guard during the Civil War, attaining the rank of lieutenant. Subsequently he was admitted to the bar. He managed his vast interests in banks, trust companies and the industries, and was one of the most prominent figures in the social life of the East. In 1893 he went abroad and thereafter lived in England and Scotland

MARTIN, Charles Cyril, American civil engineer: b Springfield, Pa, 30 Aug. 1831; d Far Rockaway, N. Y, 11 July 1903 He was educated at Rensselaer Polytechnic, Troy He was engineer in the Brooklyn navy yard during the Civil War; and afterward chief engineer of Prospect Park, Brooklyn; and was appointed John A. Roebling's second assistant in building the Brooklyn Bridge, of which he became chief

engineer after Roebling's retirement.

MARTIN, Edward Sandford, American author b Owasco, N. Y, 2 Jan. 1856, d New York City, 13 June 1939. He was graduated from Harvard, 1877; was a founder of The Lampoon, and for many years was an editor of Life He also wrote for Harper's Magazine. His published works include 'Sly Ballades in Harvard China'; (1882); 'A Little Brother of the Rich,' verses (1890); 'Pirated Poems' (1890); 'Windfalls of Observation' (1893); 'Cousin Anthony and I' (1895); 'Lucid Intervals' (1900), 'Poems and Verses' (1902); 'The Luxury of Children, and other Luxuries' (1904); 'The Courtship of a Careful Man' (1905); 'In a New Century' (1908); 'Reflections of a Beginning Husband' (1913); 'The Diary of a Nation' (1917); 'Abroad with Jane' (1918); 'What's Ahead and Meanwhile' (1927).

MARTIN, Félix, French-Canadian clergyman and author: b. Auray, Brittany, 1804; d. 1886. He emigrated to Canada in 1842, having previously entered the Society of Jesus. His task in Canada was to aid in re-establishing Jesuit missions. Saint Mary's College, Montreal, was founded by him. Père Martin made diligent search in French and Canadian archives seeking out information regarding the early Jesuit missionaries in Canada. His principal works are 'Manuel du pèlerin de Notre Dame de Bon Secours' (1848); 'Relation des Jesuites,' an enlarged edition of O'Callaghan (1850); 'Mission du Canada, relations inédites' (1861); 'De Montcalm en Canada' (1867); 'Le reverend Père Isaac Jogues' (1873).

MARTIN, François Xavier, American jurist: b. Marseilles, France, 17 March 1764; d. New Orleans, 11 Dec. 1846. He emigrated to Martinique when 18; later removed to New Berne, N. C.; taught French there, and became a printer; studied law, being admitted to the bar about 1789; and in 1792 was requested by the State legislature to compile the British statutes in force before the Revolution. He was himself a member of the assembly in 1806-07; was judge of the Mississippi Territory in 1809; went to Louisiana in the same capacity in 1810; and in 1813 became attorney-general of the new State of Louisiana. From 1815 until just before his death Martin was a member of the Supreme Court of the State Although blind for the last 10 of these 31 years, his ability was

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not impaired, and it is due to him that the law of the State was in some measure evolved from the tangle of French and Spanish statutes in which he found it. He wrote a 'History of North Carolina' (1829); 'History of Louisiana' (1827); and a version of Pothier on Obligations

MARTIN, Frederick Townsend, American author, brother of Bradley Martin: b. Albany, N. Y., 1849; d London, 1914. In 1872 he was graduated at the Albany Law School. He became a member of the New York National Guard, in which he was commissioned colonel and served a period as judge-advocate. For many years previous to his death he had lived in Europe. He was prominent in charitable enterprises and a lavish benefactor of the poor. His writings deal with the doings of the wealthy and the so-called social-elect, of which class Martin was well qualified to speak. His works include 'The Passing of the Idle Rich' (1911); 'My Personal Experiences of Meeting Snobs' (1911); 'Reminiscences of My Life' (1911), 'Things I Remember' (1913).

MARTIN, George Madden (Mrs. Attwood R Martin), American author. b Louisville, Ky, 3 May 1866 She was educated in the public schools of Louisville, finishing at home on account of her health. In 1892 she was married to Attwood R. Martin. She became a frequent contributor of short stories to magazines and periodicals and is author of 'Emmy Lou—Her Book and Heart' (1902); 'The House of Fulfilment' (1907); 'Abbie Ann' (1907); 'Letitia—Nursery Corps, U.S.A' (1907), 'Selna' (1914); 'Emmy Lou's Road to Grace' (1916); 'Warwickshire Lad' (1916); 'Children of the Mist' (1920); 'March On' (1921).

MARTIN, Gregory, English translator of the Bible: b. Maxfield, Sussex, date unknown; d. Rheims, France, 28 Oct. 1582. Martin received his education at Saint John's College, Oxford, where he took the degree of B.A. in 1561 and that of MA. in 1565 He was very well versed in Hebrew, Greek and Latin and was made tutor to Philip Howard. Martin opposed the Established Church; remained a staunch Roman Catholic and exerted a powerful influence on the Howards to remain true to the ancient faith. In 1570 his continued opposition to the new ecclesiastical order of things in England obliged him to seek refuge at Douai, Flanders, where he became professor of Hebrew in the newly-founded English College. He went to Rome in 1577 to aid in founding the English College there. In 1578 Martin went to Rheims, to which city the English College was moved from Douai, and there spent his remaining years in writing the production of the English version known as the Douai Bible. It is the official Bible for English Catholics, was made from the Vulgate of Saint Jerome and collated with the Greek and Hebrew versions. In 1582 the New Testament was issued but not until 1609-10 did the Old Testament appear. English Protestants criticized Martin's version, yet the commission of Forty-Seven made extensive use of it in preparing the Authorized Version in the reign of James I

MARTIN, Helen Faucit, LADY. See FAUCIT, HELEN.

MARTIN, Helen Reimensnyder, American author; b. Lancaster, Pa., 18 Oct. 1868; d. New Canaan, Conn., 29 June 1939. She was educated at Swarthmore and Radcliffe colleges, and in 1899 married Frederic T. Martin. She was especially noted for her depiction of Pennsylvania Dutch life, which she portrayed in numerous short stories contributed to magazines. All told she published 30 books, the last one, 'Emmy Untamed' in 1937. Other books include 'Tillie, A Mennonite Maid' (1904); 'Sabina, a Story of the Amish' (1905); 'The Betrothal of Elypholate' (1907); 'Revolt of Anne Royle' (1908); 'The Crossways' (1910); 'When Half-Gods Go' (1911); 'The Fighting Doctor' (1912); 'The Parasite' (1913); 'Barnabetta' (1914); 'For a Mess of Pottage' (1915); 'Challenged' (1925); 'Ye That Judge' (1926); 'Sylvia of the Minute' (1927).

MARTIN, Henry Austin, American surgeon: b London, 23 July 1824; d. Boston, 7 Dec 1884. He came to the United States at an early age and was graduated from the medical school at Harvard in 1845, when he established a practice in Boston. He served as a surgeon until nearly the close of the Civil War, when he resigned and was brevetted lieutenant-colonel for gallant service. He devoted his attention principally to surgery and to the treatment of small-pox, upon which subject he was a generally recognized authority. He was the originator of many important innovations in the field of surgery and published valuable professional articles in periodicals.

MARTIN, Henry Newell, American biologist: b Newry, Ireland, 1848; d. 1896. He received his education at University College, London, and at Christ's College, Cambridge, He was appointed to the chair of biology at Johns Hopkins University in 1876 and was also made director of the biological laboratory. Dr. Martin carried out important experiments on respiration. He was chosen president of the American Society of Naturalists in 1890. He published 'The Human Body' (1881); 'Observations in Regard to the Supposed Suction-Pump Action of the Mammalian Heart' (1887). Professor Martin assisted Huxley in the latter's 'Practical Biology' (1876) and edited 'Studies from the Biological Laboratory of Johns Hopkins' and the Journal of Physiology.

MARTIN, Homer Dodge, American painter: b. Albany, N. Y., 28 Oct. 1836; d. Saint Paul, Minn, 12 Feb. 1897. He was elected a member of the National Academy of Design in 1875; and resided in France in 1882–86. While he was influenced somewhat by the Barbizon School of painters, he developed a style entirely his own, which placed him among the best known of American landscape painters. His works include 'Landscape on the Seine'; 'An Equinoctial Day'; 'Brook in the Woods'; 'In the Adirondacks'; 'Sand Dunes on Lake Ontario'; and 'White Mountains, from Randolph Hill.' Consult for reproductions Carroll, D. H., 'Fifty-Eight Paintings by Homer D. Martin' (1913).

MARTIN, Joseph, Canadian statesman: b. Milton, Ontario, 24 Sept. 1852; d. 2 March 1923. He was educated in Canadian and Michigan public schools and at the University of Toronto He was admitted to the bar in 1882 and from 1882-92

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was a member of the Manitoba legislature From 1888 to 1891 he was attorney-general and minister of education of Manitoba. In the latter capacity he introduced the bill abolishing the separate school system in Manitoba and thus precipitated a memorable crisis in Manitoba and Dominion politics. Martin failed of election to the House of Commons in 1891, but sat for Winnipeg in 1893-96 He removed to British Columbia in 1897 and in the following year became a member of the legislature of that province, sitting until 1903 In 1898-99 he was provincial attorney-general and minister of education and in 1900 was premier of British Colum-In 1907 Martin was owner and editor of the Vancouver Guardian. In 1908 he removed to England, contested Southwest Warwickshire in the Liberal interest in 1909. In Canada he took an active part against the Canadian Pacific Railway monopoly, in the abolition of French as official language and advocated the introduction of the Torrens system of land registry. He was a strong freetrader and advocate of reciprocity between the United States and Canada.

MARTIN, Josiah, English colonial governor in America: b. probably in Antigua, West Indies, 23 April 1737; d London, England, July 1786 He rose to the rank of lieutenant-colonel in the British army in 1771, and in the same year was appointed to the royal governorship of North Carolina. He was successful in pacifying the "regulators," many of whom remained zealous Tories; and took a firm and energetic attitude in the maintenance of British authority. But on 24 April 1775 he was compelled to escape to the sloop Cruiser, from which on 8 August he issued a prodigiously long proclamation which the Whigs ordered burnt by the hangman. He was with Sir Peter Parker at Charleston (June 1776), and accompanied Cornwallis into North Carolina after the British victory over Gates at Camden; but in March 1781 withdrew to Long Island, and thence went to England.

MARTIN, Luther, American lawyer: b. New Brunswick, N. J. 9 Feb. 1748; d. New York, 10 July 1826. He was graduated from the College of New Jersey (Princeton) in 1766; studied law at Queenstown, Md; was admitted to the Maryland bar in 1771; in 1774 was one of the commissioners appointed to oppose the claims of Great Britain; in 1778 became attorney-general of Maryland; and in 1787 was a delegate from Maryland to the convention that framed the Constitution of the United States. His opposition to the instrument was so strong that, rather than sign it, he left the convention, thus earning from Jefferson the sobriquet of "the Federal bull-dog" In 1804 he defended Samuel Chase (q.v.) in the latter's impeachment trial before the Senate, and in 1805 resigned his attorney-generalship and resumed private practice. He was counsel for Burr in Burr's trial at Richmond in 1807, in 1814—16 was chief judge of the Baltimore Court of Oyer and Terminer, and in 1818—20 was again attorney-general of Maryland Among his writings was the series of pamphlets, 'Modern Gratitude' (1801–02). Consult Goddard, 'Luther Martin' (1887).

MARTIN, Percy F., English author and journalist: b. 30 March 1861. He received his education at University College, London, served

as correspondent in Mexico of the Times, the Tribune and the Glasgow Herald, and in India of the Times (Engineering Supplement) and the Evening Standard He also served as special correspondent of the Financial Times and The Engineer in Central and South America and as contributor to the Times Trade Supplement He has published 'Through Five Republics of South America' (1905); 'Mexico's Treasure House' (1906); 'Mexico of the Twentieth Century' (19107); 'Salvador of the Twentieth Century' (1911); 'Greece of the Twentieth Century' (1912); 'Maximilian in Mexico' (1913); 'The Sudan in Evolution' (1916); 'Egypt, Old and New' (1923). He is a contributor to periodicals and magazines.

MARTIN, Sir Theodore, English lawyer and author: b Edinburgh, 16 Sept. 1816; d. 16 Sept. 1906. He was educated at the University of Edinburgh and became a solicitor in Edinburgh in 1840. In 1846 he became a parliamentary solicitor in London, carried on an important and extensive business and varied professional cares with literary work. With Aytoun he published the once famous 'Bon Gaultier's Ballads' (1845). He married in 1851 Helen Faucit, the celebrated actress. His translations comprise many of the works of Goethe, Schiller, Horace, Catullus, etc., and he has written (Essays on the Drama'; 'Madonna Pia' (1855); 'Life of Lord Lyndhurst' (1884); 'Life of the Prince Consort' (1875-80); 'Helena Faucit, Lady Martin' (1900). He was created K.C.B. in 1881

MARTIN, Thomas Commerford, American electrical engineer and author: b. London. England, 22 July 1856; d. 17 May 1924. He was educated in an academy at Gravesend, England, by a private tutor and subsequently studied divinity. He was associated with Thomas A. Edison in laboratory work and electrical development in 1877-79 after which he engaged in editorial work. From 1883 to 1909 he was editor of the Electrical World and after 1909 he was advisory secretary of the National Electric Light Association. In 1900-15 Mr. Martin was engaged as special expert of the Census office of the United States He lectured at the Royal Institution of Engineers, La Société Internationale des Electriciens, Paris, the University of Nebraska, Columbia and Lehigh universities, Delaware College and for the New York Board of Education. He was a member of the conference committee organized by engineering societies to expend the \$1,500,000 given by Andrew Carnegie for a united engineering building and the Engineers' Club of New York Mr. Martin was a member of many scientific societies and published 'The Electric Motor and Its Applications' (1886); 'Inventions, Researches and Writings of Nikola Tesla' (1893); 'Edison — His Life and Inventions,' with F. L. Dyer (1910), and contributions to reference books, magazines and journals on electrical topics.

MARTIN, Thomas F., Democratic leader in New Jersey: b in New England, about 1868. He came to Hudson County, N. J., in 1896, and worked as a reporter on the Hudson Dispatch. Later he became business manager, and when the publishing company failed bought in the property at auction, re-established the paper and made it a political power. Entering politics, he

was chosen to represent North Hudson in the State legislature For several terms he was the Democratic leader in the House of Repre-

the Democratic leader in the frouse of Representatives, including Woodrow Wilson's governorship. After 1916 he served as secretary of state of New Jersey. He died 20 July 1926.

MARTIN, Thomas Mower, Canadian artist. b London, England, 1838 He studied art at the South Kensington Art School; remained to Canada in 1862 and satisfied in Troposto. moved to Canada in 1862 and settled in Toronto, Moved to Canada in 1002 and settled in 10070110, Ontario His best-known pictures are 'The Untamed Wilderness'; 'A Summer Idyl', 'Sunrise, Muskoka' He was one of the founders of the Royal Canadian Academy, the Ontario Society of Artists, the Art Union of Ontario and the Ontario School of Art. His publications are 'An Artist's Letters from the Rockies' (1889) and 'Canada from an Antist's Point of View' (1895). Died 15 March 1934.

MARTIN, Thomas Staples, American legislator: b. Scottsville, Va., 29 July 1847; d. Charlottesville, Va., 12 Nov. 1919. After 1853 he resided on a farm not far from his birth-place. In 1864-65 he was a cadet at the Vir-ginia Military Institute and for much of that period was actually connected with the army of the Confederate States. In 1865-67 he studied at the University of Virginia and in 1869 was admitted to the practice of law. After 1895 he was United States senator from Virginia.

MARTIN, Victoria Claffin Woodhull, Anglo-American financier and reformer b. Homer, Ohio, 23 Sept 1838 In 1852 she mar-ried Canning Woodhull, from whom she later separated Her second marriage was to John Biddulph Martin who died in 1897. With her sister, in 1870, Mrs. Woodhull founded a stock brokerage house in New York, from which there was issued Woodhull and Classin's Weekly. For many years she edited the Humanitarian Magazine In 1870 Mrs. Woodhull memorialized Congress for women's suffrage, and lectured throughout the United States on finance, women's suffrage, religious and scientific im-provement of the human race, etc. In 1872 she was nominated for the Presidency of the United States by the Equal Rights party. She organized conventions for the discussion of social reform, carried on a continuous propaganda work in the interests of the working classes both in America and Europe for over 30 years. Mrs. Martin's publications include 'The Origin, Tendencies, and Principles of Government'; 'Social Freedom'; 'Garden of Eden Stirpiculture'; 'Rapid Multiplication of the Unit'; 'The Human Body the Temple of God'; 'Argument for Woman's Electoral Rights,' etc. She died in Tewkesbury, England, 9 June 1927

MARTIN. William Alexander Parsons

MARTIN, William Alexander Parsons, American educator b. Livonia, Ind, 10 April 1827; d. 18 Dec. 1916 He was graduated from the Indiana State University and studied theology. He went to China as a missionary in 1850 and has spent the greater there of his life there engaged in education. share of his life there engaged in educational and missionary work. He assisted in making the treaty between the United States and China in 1858, and was an authority in China on questions of international law He was professor and president of Tung Wen College 1868-98, and then president of the New Imperial University until 1900, when it was destroyed in the siege of Peking, in which city

he was imprisoned with the American legation. In 1902 he was appointed president of the University of Wuchong. He edited in Chinese the Peking Scientific Magazine, and the Science Monthly, and has published 'Siege in Peking' (1900); 'Chinese Legends,' 'The Lore of Cathay' (1901), etc.

MARTIN, William McChesney, Jr., American banker: b. St. Louis, Mo., 17 Dec 1906 He was graduated from Yale in 1928, and thereafter studied at Benton College of Law in St Louis, and at Columbia. In 1928 he entered the bank examination department of the Federal Reserve Bank of St. Louis, and a year later, the banking firm of A. G. Edwards & Sons in St. Louis, becoming a partner in 1931. Since that time he has been associated with the New York Stock Exchange, becoming governor in 1935, chairman of the constitution committee, 1936–37, and secretary of the Conway reorganization committee, 1937-38 He was elected president of the exchange in 1938, and again in 1940 for a one-year term, the first definite term of office in the history of the exchange. He is the author of 'Modern Banking and Trust Company Methods' and many pamphlets on banking.

MARTIN DE MOUSSY, Jean Antoine Victor, French physician. b. Moussy-le-Vieux, 1810, d. 1869 His medical education was obtained in Paris, where he practised in the military hospitals He removed to Montevideo, Uruguay, in 1841 and in 1843-52 directed the medical service of the French and Italians engaged in the siege of the city. In 1852 Dr. Martin was engaged by the Urquiza government to prepare a work on the geography of Uruguay. In order to prepare himself for the task he traveled to and down theself. traveled up and down the country in the years 1855-59. The work appeared in three volumes under the title 'Description géographique statistique de la confédération argentine' (1864).

MARTIN, Tenn, city in Weakley County; alt. 475 feet; Ilm S. of Fulton, Ky.; on Illinois Central; and Nashville, Chattanooga and St. Louis railroads The University of Tennessee Junior College is here. Pop. (1940) 3,587.

MARTIN, a swallow (q.v.). In the United States the name is restricted to the purple martin (q v.), several other species of which (genus Progne) are familiar garden birds in South America The bank-swallow (qv) is some-times called sand-martin, especially in England, where the term is more generally used as a synonym of "swallow" than in America

MARTINE, James Edgar, American legislator: b. New York, N. Y., 25 Aug. 1850; d. 26 Feb. 1926. He received a public school education; engaged in farming near Plainfield, N. J.; acquired real estate and building interests. At various times he was candidate for the New Jersey house of representatives, the senate and other offices When Woodrow Wilson was governor of New Jersey Martine was one of his most ardent supporters and became United States senator for the term 1911-17. In the Senate of the United States he warmly championed the cause of labor in the discussions in regard to working conditions, wages, etc., in the coal mines of West Virginia and Colorado.

MARTINEAU, mar'ti-nō, Harriet, English author b. Norwich, 12 June 1802; d. Ambleside, 27 June 1876. She was a sister of James

Martineau (qv). Her first work, 'Devotional Exercises for the Use of Young Persons,' appeared in 1823, and in 1830-31 she won three prizes offered by the Central Unitarian Association for as many essays designed to convert respectively the Catholics, the Jews and the Mohammedans "The essays," observes a biographer, "probably converted nobody, but brought in 45 guineas" Next came several stories, mostly intended to inculcate some useful lesson, such as those having the title, 'Illustrations of Political Economy' (1831-34), which were followed by 'Illustrations of Taxation' (1834), and gained an immediate recognition. After a sojourn in the United States (19 Sept 1834-1 Aug. 1836), she published 'Society in America) (1837), intended as a comparison of "the existing state of society in America with the principles on which it is proposedly founded," and 'A Retrospect of Western Travels' (1838). including some criticisms of slavery that were not well received in this country. Up to about 1851 Miss Martineau had been known as a Unitarian, but she later showed a decided leaning toward Positivism, and in 1853 published a condensation of Comte's 'Positive Philosophy.' Among her other works of importance may be mentioned her 'History of England during the Thirty Years' Peace' (1849). During the last 20 years of her life her writings consisted mainly of pamphlets and contributions to newspapers and periodicals. A remarkably candid autobiography, which had been written for many years, was published after her death (1877). Consult also Miller, 'Harriet Martineau, (1884).

MARTINEAU, James, English Unitarian clergyman and philosopher: b. Norwich, 21 April 1805; d. London, 11 Jan 1900. His Thomas Martineau, the great-grandson of a Huguenot surgeon who left France after the revocation of the Edict of Nantes, was a manufacturer of bombazines. Harriet Martineau (q.v.) was an elder sister He was sent to Derby in 1821 to study civil engineering, to Derby in 1821 to study civil engineering, but in the following year became a student of Manchester College. In 1827 he took charge for a year of Dr. Lant Carpenter's school in Bristol, and in 1828 he accepted a call to the copastorship of Eustace Street Presbyterian Church, Dublin In 1831 he published Hymns Church of Chicking Worship) and next year resigned tor Christian Worship,' and next year resigned his pastorate, but shortly afterward accepted the copastorate of Paradise Street Chapel, Liverpool, of which, in 1835, he became sole pastor. In 1836 appeared his first separate original work, 'The Rationale of Religious Inquiry,' which attracted considerable attention. In 1839 he was associated with J. H. Thom and Henry Giles in the defense of Unitarianism against attacks by orthodox clergymen, and of 13 addresses published in 'Unitarianism Defended' (1839), five were by Martineau. In 1840 he published his collection of 'Hymns for the Christian Church and Home,' and in the same year was appointed professor of mental and moral philosophy and of political economy in his old college, now named Manchester New College. On the removal of the college to London in 1853 he retained his professorship, but did not settle in London till 1857. In 1848-49 he spent 15 months on the Continent, mostly in Germany,

during which his philosophical opinions were profoundly influenced by the study of Greek and German philosophy under Trendelenburg The remaining publications of his first Liverpool period are an essay on 'The Five Points of Christian Faith' (1841), and the well-known collection of sermons entitled 'Endeavors after the Christian Life' (1843-47) During the period 1849-57, when he was pastor of Hope Street Church, Liverpool, he published many articles in reviews, among them that on 'Mesmeric Atheism,' which finally completed his sister Harriet's estrangement from him In 1859, being now in London, he and J J. Taylor, principal of Manchester New College, were chosen joint ministers of Little Portland Street Chapel, but from 1860 till his resignation in 1872 Martineau alone supplied the pulpit On Taylor's death in 1869 he became principal On Taylor's death in 1869 he became principal of the college, a post which he held till his resignation in 1885 In 1866 he was a candidate for the chair of logic and mental philosophy in University College, London, but the united opposition of orthodoxy and secularism led by George Grotte managed to defeat him by a single vote His publications include 'Studies of Christianity' (1869), a volume of sermons; 'Why Dissent?' (1871); 'Hymns of Praise and Prayer' (1873); 'Modern Materialism: Its Attitude towards Theology' (1876), a masterly attack on Tyndall 'Modern Materialism: Its Attitude towards Theology' (1876), a masterly attack on Tyndall and the scientific materialists; 'Essays, Theological and Philosophical' (1875); 'Hours of Thought on Sacred Things' (1876–80); 'Ideal Substitutes for God Considered' (1880), a criticism of Moral Idealism; 'A Study of Spinoza' (1883), his first great philosophical work; and 'Types of Ethical Theory' (1885), the earlier of his two masterpieces. During the remaining years of his life he published his great defense of the essential principles the remaining years of his life he published his great defense of the essential principles of religion entitled 'A Study of Religion' Its Source and Contents' (1888); and his freely critical 'Seat of Authority in Religion' (1890). The first academical degree conferred upon him was that of LLD by Harvard in 1872, but he received later the degrees of STD from Leyden (1875), DD from Edinburgh (1884), D.C.L from Oxford (1888), and Litt D. from Dublin (1892). Martineau was one of the most eminent preschers of his time. one of the most eminent preachers of his time, but his greatest work was done in the fields of ethics and philosophical theology At first a necessarian and utilitarian, he was latterly the great modern champion of free-will and intuitionalism. In the development of his Christology from a sort of Arianism to complete Humanitarianism, and in his ever-increasing insistence upon the continuity of revelation and the purely internal character of ultimate religious authority, he sums up more than any other the history of Unitarianism, and indeed of liberal theology generally during the 19th century. He was a powerful and eloquent champion of Theism against scientific agnosticism and materialism All his works are written in a uniquely rhythmic style, characterwritten in a uniquely rhythmic style, characterized by a profuse and happy use of figurative language. Consult Jackson, 'James Martineau: A Biography and a Study' (1900); Sidgwick, 'Lectures on the Ethics of Green, Spencer and Martineau' (1902); Drummond, 'Life and Letters of James Martineau'; and Upton 'A Survey of Philosophical Work' (1902).

MARTINELLI, Giovanni, Italian operatic tenor: b. near Montagnana, Italy, 22 Oct. 1885. He began his musical career as a clarinetist in an Italian regimental band; studied voice under Professor Mandolini, and made his debut as Ernani, in Milan. He was heard by Puccini, and engaged by the latter to appear as Dick Johnson in 'The Girl of the Golden West' in Rome. He sang the same rôle at Covent Garden, London, in 1912, and also appeared there in 'Jewels of Madonna,' etc. In 1913 he joined the Metropolitan Opera Company of New York, as a leading tenor, and after the death of Enrico Caruso assumed many of that great artist's rôles. In 1924 he revived 'La Juive,' the last opera sung by Caruso. He has sung at Pest, Brussels, Buenos Aires, Havana, and various other places.

MARTINEZ, Enriquez, en-re'keth mar-teneth, or Enrico, Mexican engineer. b. about 1570, d in Mexico, 1632. His birthplace is variously given as Germany, Holland, Spain (in Ayamonte, Andalusia) or Mexico. He studied engineering in Spain; went to Mexico as interpreter to the Inquisition and with the title of cosmographer royal; and in 1607 undertook to drain the valley of Mexico, threatened by lakes Zumpango and San Cristobal His canal was fairly successful but inadequate, and after various experiments on the part of the other engineers, with whose work Martinez was accused of tampering, he was bidden enlarge his tunnel and canal He died before the work was much more than started Martinez established a printing-press in the City of Mexico, on astronomy and on trigonometry. His works are 'Discurso sobre la magna conjunción de los planetas Júpiter y Saturno, acaecida en 24 Diciembre 1603 en Sagitario' (Mexico 1604); 'Repertorio de los tiempos, é historia natural de Nueva España' (Mexico 1606); 'Tratado de Trigonometria.'

MARTINEZ DE CAMPOS, Arsenio. See Campos, Arsenio Martinez de

MARTINEZ DE ROZAS, Juan, hoo-ān' mar-tē-něth dā rō'zas, Chilean statesman: b. Mendoza, Argentina, 1759; d. there, 3 March 1813. He was educated at Cordova; studied law at Santiago; became professor at San Carlos, Chile, in 1781; in 1787 was made assistant intendant of the province of Concepcion; and in 1796 had risen to the second command in the presidency. He took a prominent part in planning the revolution of 1810; was a member of the governing junta until 1811, when he became its president; and showed himself an able administrator and a brave soldier. Carrera quarreled with him, got the upper hand and banished him to his birthplace, only a few months before his death

MARTINEZ, mär-te'nez, Calif, city and Contra Costa County seat; alt. 12 feet; on Carquinez Straits (opposite Benicia); and on the Santa Fe, and Southern Pacific railroads; 35m. NE. of San Francisco. In a fruit, livestock, mining and petroleum region, it packs fruit, has vegetable and fish canneries, refines gasoline, fuel and other oils, manufactures fertilizer, smelts copper, and has railroad repair shops. Here is the home of John Muir (q.v) Settled in 1849, Martinez was named for Vincente Martinez (commandante of San Francisco Presidio in 1823). It has a mayor and council. Pop. (1940) 7,381.

MARTINI, mar-tē'nē, Simone, Italian painter, sometimes mistakenly called Simone Memmi b Siena, about 1284; d Avignon, 1344 He was the founder of the Sienese school of painting and executed frescoes in the churches of Siena, Assisi, Naples and Orvieto. At the invitation of Pope Benedict XII he went to Avignon and in collaboration with his brother, Donato, decorated the papal palace. He seems to have aimed at flat decorative effect rather than artistic boldness and originality in his wall painting and his color is harmonious and fresh, though his faces are conventional. The large painting of the Madonna on the walls of the Palazzo Pubblico is his most important work at Siena (1315); at Florence is to be seen an 'Annunciation' of his in the Uffizi, and fragments of his work also survive at Avignon. His other more important pictures are Way to Golgotha' (1333) in the Louvre; 'The Blessing of Christ' in the Vatican, 'Christ as a Child with His Parents' in the Royal Institution, Liverpool; 'Saint Louis of Toulouse' in San Lorenzo, Naples; fragments at Pisa, Arvieto. Fenway Court, Boston, contains some examples of his work Consult Berenson, Bernhard, 'Central Italian Painters of the Renaissance' (New York 1897).

MARTINIQUE, mar-ti-nēk', West Indies, an island of the Lesser Antilles and, except Guadeloupe, the largest in the Caribbean chain. Area, 385 square miles. It is very mountainous: Mount Pelée, in the northwest, 4,900 feet, Mount Carbet but a little lower, while a peak near the southern coast rises to the height of 3,950 feet. The thermometer ranges between 76° and 88° F., the summers being hot and dry, autumn and a part of winter hot and rainy, and spring comparatively cool. The inhabitants number about 246,000. About 3 per cent are Caucasians, who reside chiefly in Saint Pierre; the balance of the population—those who, in the main, suffered least from the disaster of 1902—are described as negroes, mulattoes, «copre, chabin and matés»—that is, blends of the African, Carib Indian (qv.), Mongolian and French races. A large part of the surface is covered with tropical forests with species of mahogany, etc. The flora is closely related to that of South America; the fauna abound in minor reptiles and insects. Of the snake kind the most dreaded is the fer-de-lance, whose bite is fatal. The mongoose has practically exterminated this serpent within recent years.

Sugar cane is the chief crop of Martinique, and sugar is the chief article of export. A part of the cane is converted into rum, which, after sugar, is the greatest article of export. Production annually exceeds 35,000 metric tons. Cacao plantations cover an area of 1,500 hectares, and cacao is one of the most important exports. Coffee, once an important article of commerce, has dwindled almost to nothing, because of a destructive disease which has ruined most of the important plantations. Other crops are vanilla, bananas, pineapples and tobacco.

Martinique is a colony of France, sending one senator and two deputies to the French Parliament. It is administered by a governor and a general council. There is a law school at Fort-de-France, and primary schools, a commercial school, a lycée for boys, a high school for girls, and a school of arts and crafts. Elemen-

tary pupils number 28,000 The island was acquired by the French in 1635. Toward the close of the 18th and beginning of the 19th centuries it was temporarily held by the British. In May 1902 volcanic eruptions from Mount Pelée destroyed Saint Pierre, which was the largest city on the island, with a population of 26,011, and the residents of that place perished, almost without exception; but the statement commonly made, that "a great part of the island was overwhelmed," is incorrect. The scope of Pelée's work was limited. (See Pelée, Mont). About 10,000 persons besides those in Saint Pierre lost their lives (in all, 20 per cent of the total population); the best agricultural regions, however, in the south and along the eastern coast were uninjured. The capital, Fort-de-France (pop. 52,000), is situated in the southwest and is important as being the military and naval headquarters and rendezvous in the French Antilles; the terminus of the French transatlantic steamers and West Indian cable system. For local traffic there are mail coaches and motor-cars, which receive a subsidy from the government, and subsidized steamers ply on the coast. The bank of Martinique, situated at Fort-de-France, has a capital of 3,000,000 francs. A statue of the Empress Josephine, who was born in Martinique, is one of the ornaments of the public gardens of Fort-de-France. In 1938 the military force consisted of one company of infantry and one battery of artillery. The capital was nearly consumed by fire in 1890 and partially destroyed by an earthquake in 1839.

MARTINS FERRY, Ohio, city in Belmont County, alt. 660 feet, on the Ohio River and the Pennsylvania; Baltimore and Ohio; and Wheeling and Lake Erie railroads, 60m. S. of Pittsburgh. Its industrial activities center about steel and soft coal; tin plate, galvanized ware, and jewelry are some of its products. The city has a library and a hospital. Settled before 1785, in which year an effort was made to move the settlers back to the Virginia side, Martins Ferry was incorporated as a town in 1865, and chartered as a city in 1885. At different times in its early history the community was known as Norristown, Jefferson, and Martinsville. The present name honors Ebenezer Martin and commemorates the ferry which he operated here in the 1830's, to facilitate the westward migration of the times. The city has a mayor and council. The water, light, and power system are publicly owned. Pop. (1930) 14,524; (1940) 14,729.

MARTINSBURG, W. Va., city and Berkeley County seat, alt 435 feet, on the Baltimore and Ohio and the Pennsylvania railroads, 23m. NE. of Winchester, Va.; on state and federal highways, 92m. NW. of Washington, by motor. The municipal airport, Shepherd Field, is just outside the city; it covers 97 acres, with a 3,500 foot runway, hangars, and provision for field services. The city stands at the head of the Shenandoah Valley; the surrounding country is agricultural and is famed for its production of fruit, especially apples and peaches Fruit packing and the making of apple by-products such as cider vinegar are important items in the industry of the city and county. Seamless hose for men, women's garments, and upholstery for automobiles are major products of Martinsburg industry, and furniture and paper boxes are

made. Several plants produce brick and tile, road surfacing material, and cement. Outside the city are quarries producing building stone and lime for use in agriculture. The Baltimore and Ohio Railroad has large repair shops at Martinsburg The city has a public library, housed in the city hall, with more than 60,000 volumes and serving the people not only of the city but of the entire county. The two hospitals can accommodate 225 patients, and the health department conducts clinics and sanitary inspections. There are numerous social, fraternal, and civic organizations, and good banks, hotels, schools, and churches. The town was laid out by Gen. Adam Stephen and named in honor of his friend Col T. B. Martin; both men were officers in the Revolutionary War. Incorporation dates from 1778. The city has mayor and council. The water system is city-owned. Pop. (1930) 14,857; (1940) 15,063.

Martinsburg in Civil War.—Martinsburg

was an important point in the military operations in the Shenandoah Valley, because of its strategic position with regard to highways and rail-roads. In 1861, '62, and '63 it was the scene of several spirited skirmishes, and was held alternately for short periods by the Federals and the Confederates. In June 1863 Ewell's corps, moving down the valley in the Gettysburg campaign, detached a brigade of cavalry and a division of infantry in an endeavor to surround the Union forces at Martinsburg and was unsuccessful, though inflicting heavy losses. On 1 July, 1864, Martinsburg was held by the Federal General Sigel with about 3,200 infantry and dismounted cavalry and a battery. On the 2d, Early arrived at Winchester on his campaign to menace Washington and, under General Lee's instructions, to clear out the lower valley and wreck the Baltimore and Ohio Railroad. Parties were sent north and west against the railroad, and on the 3d Bradley T. Johnson, with a cavalry brigade, was ordered to move through Smithfield and Lee Town, cross the railroad at Kearnysville, east of Martinsburg, and, pushing north, unite with McCausland at Hainesville beyond Martinsburg. Johnson arrived at Lee Town early in the morning, where he was met by Col J. A Mulligan with about 2,000 men and a battery, and after a hard fight was driven back on the divisions of Rodes and Ramseur, which were supporting him. Breckinridge's division, which marched on the main road to Martinsburg, drove before it Stahel's cavalry, on outpost at Darkesville. Sigel, warned of approaching danger, burned his stores, collected his command, and, leaving Martinsburgh and the stores of the stores. tinsburg on the night of the 3d, crossed the Potomac at Shepherdstown and occupied Maryland Heights. Early cleared the valley and adiand rieignts. Early cleared the valley and advanced on Washington, and on the 11th Martinsburg was occupied by Sullivan's division of Hunter's command, and remained in Union occupation until the 25th, when Crook, being defeated by Early at Kernstown, was driven through Winchester, made a short stand at Martinsburg and recrossed the Potomac at Williamsport, Early again occupying the town and destroying the railroad on either side of it and destroying the railroad on either side of 1t, and continuing in possession until 10 August, when, upon Sheridan's advance to Halltown, he abandoned Martinsburg and Winchester and fell back to Strasburg. He advanced from Stras-burg on the 17th and reoccupied Martinsburg

on the 19th with his cavalry. From this time until 17 September the place was held alternately by Union and Confederate cavalry, on the 17th by Averell's Union division. On that day Early left Winchester with a heavy force of infantry, cavalry and artillery, and on the 18th attacked and drove Averell from Martinsburg across the Opequon Sheridan defeated Early on the Opequon on the 19th, and drove him up the valley, and Martinsburg was again occupied by Union troops, to remain in their possession until the close of the war.

MARTINSVILLE, Ind, city in Morgan County; alt. 599 feet; 31m SW. of Indianapolis; on the Pennsylvania; and the Big Four railroads. The surrounding area grows grain, and has good timber. There is a state forest in the vicinity. Artesian mineral wells in the city make it attractive as a health resort. The industrial products are articles of clay, hickory chairs, mineral water crystals, and canned vegetables. The city was founded in 1822. Pop. (1930) 4,962; (1940) 5,009.

MARTINSVILLE, Va., city and Henry County seat, alt 1,128 feet; on Smith River; and on the Danville and Western, and the Norfolk and Western railroads; 62m S. of Roanoke. It is in a region of farms and forest, where industrialism is developing. Factories here produce furniture, garments, and nylon, and textiles are spun, knitted, and dyed. Martinsville was named for Gen Joseph Martin (born 1740) It was founded in 1793; became a city in 1928 It has mayor and council; water, power and light systems are city-owned. Pop. (1930) 7,705; (1940) 10,080.

- MARTINY, Philip, American sculptor: b. Alsace, 19 May 1858, d. New York, 26 June 1927. His boyhood was spent in France working in various studios. Early in the 80's he came to America and made further studies under the direction of Saint-Gaudens. Martiny's efforts in decorative sculpture were conspicuously successful and his work improved this branch of art in the United States Among his best-known works are the sculpture on the grand staircase of the Congressional Library, Washington; the Carnegie Library, Washington; the New York Hall of Records; Chamber of Commerce groups, New York; bronze doors of Saint Bartholomew's, New York; a fountain and figures in the Clark residence, New York; Soldiers' and Sailors' Monument, Jersey City; McKinley Monument, Springfield, Mass.; statue of Vice-President Hobart at Paterson, N. J., and the de Gernay Monument at Newport, R. I.

MARTY, Martin, Roman Catholic bishop: b. Schwyz, Switzerland, 12 Jan 1834; d. Saint Cloud, Minn, 19 Sept. 1896. He received a collegiate education in Switzerland and Austria, was ordained to the priesthood in 1856 and in 1860 came to the United States. He assisted in the founding of a priory at Saint Meinrad's, Ind., and was its first superior; through his efforts the priory became an abbey in 1870 and Marty was raised to the rank of mitred abbot. He resigned his office several years later in order to perform mission work among the Indians of Dakota, over whom he gained a wide influence. He mastered their language and wrote a Sioux grammar and dictionary. In 1880 he became the first bishop of Sioux Falls,

and in 1894 was transferred to Saint Cloud, Minn.

MARTYN, mar'tin, Henry, English missionary to India b Truro, Cornwall, 18 Feb. 1781, d. Tokat, Asia Minor, 16 Oct. 1812. He was graduated from Saint John's College, Cambridge, in 1801; became a Fellow of the same college in the next year, and, turning from the law, took orders, and landed in India in 1806. After three years at Dinapore he was transfered to Cawnpore, where he opened a church in 1810, in spite of violent opposition, and where he completed a Hindustani version of the New Testament. To perfect a translation of the New Testament into Persian and to recover his health in 1811 he traveled into Persia. In Tabriz he was taken ill with a fever, and on his hurried journey home was compelled to stop at the plague-stricken town of Tokat, where he died. In 1856 a monument to his memory was erected there. He was the great missionwas erected there He was the great missionary hero of the Church of England up to the early part of the 19th century. Martyn's works include 'Controversial Tracts on Christianity and Mohammedanism' (1824), and versions of various parts of the Bible into Hindustani, Permitted Tracks Consult Bell C. D. sian and Judæo-Persic. Consult Bell, C. D, 'Henry Martyn' (New York 1881); Smith, George, 'Henry Martyn, Saint and Scholar, First Modern Missionary to the Mohammedans, 1781–1812 (London 1892); Wilberforce, Samuel (ed), Journals and Letters of the Reverend Henry Martyn' (2 vols., London 1837).

MARTYN, William Carlos, American Presbyterian clergyman, historical writer and lecturer: b New York City, 15 Dec. 1841, d. 4 Aug. 1917. He studied law at Columbia under Prof Theodore Dwight, 1859-60, and was graduated from Union Theological Seminary in 1869 and ordained to the Congregational ministry. He held important charges in Saint Louis, Chicago and New York; 1897-1902 was literary director in a New York publishing house, and has contributed largely to magazines and periodicals. His historical and biographical works cover a wide circle and include (Martin Luther) (1866); 'John Milton' (1866); 'Pilgrim Fathers of New England' (1870); 'The Puritans' (1867); 'The Huguenots' (1867); 'The Dutch Reformation' (1868) 'John B. Gough' (1893); 'William E. Dodge' (1891), and 'Wendell Phillips' (1890), this last having an enormous circulation. In other veins were a work on 'Christian Chizenship' (1896), and a novel, 'Sour Saints and Sweet Simers' (1898). After 1905 Dr. Martyn resided in Noroton, Conn., and served the Presbyterian church there. At various times and places literary honors and dignities came to him.

MARTYNIA, a genus of annual and perennial herb of the family Martyniaceæ The 10 species have thick sub-erect stems, opposite or alternate heart-shaped leaves, showy catalpalike flowers in short terminal racemes, and horned capsules which suggest the names unicorn plant and proboscis-flower. When ripe the capsules split and expose numerous black wrinkled seeds. The stems and foliage are clammy and malodorous, but the flowers of some species not unpleasantly perfumed. The species are all natives of warm parts of America. They are often planted for ornaments, as curiosities and for their capsules, which while

young and tender are used as material for pickles. M louisiana, to which the popular names are generally applied, is the most commonly grown

MARTYR (Greek for "witness"), a designation applied by the Christian Church to those persons in particular who, in the early ages of Christianity, suffered death rather than re-nounce their faith, and thus testified their confidence in the truth of the new doctrines Martyrs are sometimes classified as of three classes: martyrs in will and deed, like Saint Stephen; those in will, but not in deed, like Saint John, who escaped from the death ordained for him by Domitian, and those in deed but not in will, like the Holy Innocents. An account of the life, persecutions and death of the Christian martyrs is called a martyrology (q v). A tomb or oratory erected on the spot where a martyr suffered was called martyrium, martyry. Festivals in honor of the martyrs seem to have been observed as early as the 2d century The Christians offered prayers at the martyry and thanked God for the example which they had given to the world. The rate which they had given to the world. was concluded with the sacrament of the Lord's supper and the distribution of alms. Eulogies were also delivered and accounts of the lives and actions of the deceased read. These festivals were called the birthdays of the martyrs, because on the day of their death they were born to eternal life. There are 14,000 martyrs commemorated in the Roman martyrology. In the early centuries of Christianity the bishop of the locality certified the names of those who were deemed worthy of the title of martyr, but after 1100 this designation became more and more reserved to the Pope, especially since 1636.

MARTYR, mar'ter, Peter. See Peter Martyr.

MARTYRE DE SAINT SEBASTIAN, Le (The Martyrdom of Saint Sebastian), an oratorio by Debussy which had its first performance at Paris on 22 May 1911.

MARTYROLOGY, called also calendar of the saints, the acts of the saints, menology, anology, synaxary, a list of martyrs and other saints, in which was sometimes noted the character of their lives, and in the case of a martyr the place and date of his martyrdom and the nature of the sufferings which he underwent. Baronius, an ecclesiastical historian of the 16th century, attributes to Saint Clement of Rome, almost contemporary with the apostles, the first idea of collecting the acts of the martyrs. In the time of Gregory the Great (end of the 6th century) the Church possessed a general martyrology, the author of which is said to have been Saint Jerome, who made use of materials collected by Eusebius of Cæsarea. only part of it now extant is a catalogue of the martyrs who suffered in Palestine during the last eight years of the persecution of Diocletian. There is a martyrology attributed to Bede (beginning of 8th century), but if not altogether spurious it is at least interpolated. Numerous martyrologies were produced in the next century and subsequently. In 1586, under the auspices of Sixtus V, a martyrology was printed at Rome, with notes by Baronius, with the title of 'Martyrologium Universale' Ruinart's 'Acta Primorum Martyrum Sincera' appeared

at Paris in 1689, and a new edition of it was published in 1859 The 'Acta Sanctorum' (qv) of the Bollandists comprises over 60 volumes issued at various times from 1643, but the work is still incomplete. The well-known English work of John Foxe, 'The Book of Martyrs' (Protestant), may also be mentioned Consult Achelis, 'Die Martyrologien, ihre Geschichte und ihr Wert' (Berlin 1900), Lammer, 'De Martyrologio Romano, Parergon Historico-criticum' (Regensburg 1878); 'Martyrologium Sancti Hieronymi' (in 'Acta Sanctorum' for November, Paris 1894); Kenrick, Francis P. (ed), 'The Roman Martyrology' (Baltimore 1907); Delhaye, 'Le témoignage des martyrologes' (in 'Analecta Bollandiana,' Vol. XXVI, Paris 1907).

MARULIC, Marko, a Croatian poet and historian b. Spalato in 1450; d. 1524. After studying at Padua he entered a monastery in Spalato, where he wrote most of the works which stamped him as the foremost of Croatian authors and rendered his name one of the greatest in the literature of Ragusa Among his works the most noted was 'De Institutione Bene Vivendi,' published in 1511. It was translated several times In his native tongue he wrote mystery plays, the first of their kind in the Croatian language, and several poems, best of which is 'The History of Judith' His poems were republished with a biography (Agram 1869).

MARVEL, Ik. See MITCHELL, DONALD GRANT

MARVELL, Andrew, English poet and satirist b. Winestead, Holderness, Yorkshire, 31 March 1621; d. London, 18 Aug 1678 He was graduated from Trinity College, Cambridge, in 1638; after activity as poet and tutor became colleague of Milton in the Latin secretaryship in 1637; was three times elected to Parliament for Hull, and under the Restoration attacked Charles II and advocated a republic While a true literary genius most of Marvell's work has little appeal to moderns, because it deals with persons and incidents long since passed away and forgotten. His lyrics, however, are immortal, and through them his place in English literature is assured for all time. His chief poem is the 'Horatian Ode Upon Cromwell's Return from Ireland' (written 1650; first printed 1776). The shorter poem, 'The Bermudas,' is also well known. Consult his 'Works,' edited by T. Cooke (2 vols, London 1726); 'Works,' edited by E. Thompson (3 vols, London 1776); 'Poems and Satires,' edited by G. A. Aitken (2 vols., ib. 1892); 'Poems and Satires,' edited by E. Wright (ib. 1904); Birrell, Augustine, 'Life of Andrew Marvell' (in 'English Men of Letters Series,' London 1905); Brown, John, 'Andrew Marvell' (in 'Cambridge History of English Literature,' Vol. VII, Cambridge 1911); Dove, 'Life of Andrew Marvell' (London 1832).

MARVIN, Charles Frederick, American meteorologist: b. Putnam, Ohio, 7 Oct 1858. He was graduated as a mechanical engineer from the Ohio State University in 1883, where he had been instructor in mechanical drawing and laboratory practice since 1879 In 1884 he was appointed to the United States Signal Service and later was made professor of me-

teorology in the weather bureau, of which he was chief, 1913-34. He made many important meteorological investigations and discoveries, and invented numerous meteorological instruments. Died, Washington, D. C., 5 June 1943.

invented numerous meteorological instruments. Died, Washington, D. C., 5 June 1943.

MARVIN, Enoch Mather, American Methodist Episcopal clergyman: b. Warren County, Mo, 1823; d. 1877 He was self-educated; became a minister of the Methodist Episcopal Church in 1841 as member of the Missouri Conference Upon the division of the Methodist body in 1844 he cast his lot with the Methodist Church South. In the Civil War he was for two years a chaplain in the Confederate army He was chosen bishop of his Church in 1866 and at the time of his death had just returned from a missionary tour which took him all around the world. He published 'Errors of the Papacy and Transubstantiation' (1860); 'The Life of William Goff Caples' (1871); 'Sermons' (1876); 'The Doctrinal Integrity of Methodism' (1878); 'To the East by Way of the West' (1879); 'The Methodist Episcopal Churches, North and South' Consult Finney, T. M., 'The Life and Labors of Enoch Mather Marvin' (Saint Louis 1880).

MARVIN, Frederic Rowland, American clergyman, essayist and poet: b. Troy, N Y, 23 Sept 1847; d. 22 July 1918. Son of Rev. Uriah and Margaret Jane (Stevens) Marvin; educated at Lafayette and Union colleges, College of Physicians and Surgeons, New Brunswick Seminary; sometime professor in New York Free Medical College for Women; pastor of Congregational churches in Middletown, N. Y., Portland, Ore., Great Barrington, Mass, retiring in 1895 for study and travel in Europe; settled at Albany, N. Y, after 1900. Among his works are 'Literature of the Insane'; 'Epidemic Delusions'; 'Last Words of Distinguished Men and Women'; 'Book of Quatrains'; 'Excursions of a Book-Lover'; 'Poems and Translations'; 'Companionship of Books'; 'Christ Among the Cattle'; 'Flowers of Song from Many Lands'; 'Love and Letters'; 'Fireside Papers' Consult also 'The Top of the Wine-Jar,' a volume of selections from the author's 10 works, with a literary estimate by Livingston Stebbins.

MARX, marks, Karl, German Socialist: b. Trèves, 5 May 1818; d London, 14 March 1883. He was educated at the universities of Bonn and Berlin, and in 1842 took up journalism, becoming editor of the Rheimische Zeitung, a Democratic journal; his socialistic articles in this paper caused its suppression in 1843. Marx then proceeded to Paris, where he became one of the editors of the Deutsch-Französische Jahrbücher, to which he contributed articles on the "Hegelian Philosophy of Right." He was expelled from France in 1845, and retired to Brussels, where he assisted in organizing the German Workingmen's Association, was also active in the organization of the Communist League, and with Engels issued the famous Communist Manifesto in 1847, which was the first public declaration of international Socialism In 1848 Marx returned to Germany, started the Neue Rheimische Zeitung, and was active in the revolutionary movements of that year. Banished from Germany in 1849, he went first to Paris, then to London, where he lived till the time of his death. He devoted himself

largely to the study of economic questions, and was correspondent of the New York Tribune and other papers. In 1864 he took a leading part in the organization of the International Workingmen's Association (q.v.) was selected to formulate its program and practically shaped its policy for a number of years; he was also interested in the organization of the German Social Democrats who united with the International in 1869. After 1873 he took no active part in politics, but devoted his time to the completion of his work on capitalism, 'Das Kapital' ('Capital'), the first volume of which had been published in 1867 (English trans, 1886); the second and third volumes were left in manuscripts, and volume II was published in 1885; volume III in 1894, under the editorship of Engel He also wrote 'Zur Kritik der Politischen Oekonomie' (1859); 'Lohnarbeit und Kapital' (English trans, 'Wage Labor and Capital'); 'Misère de la Philosophie' (1847); 'The 18th Brumaire of Louis Bonaparte' (1852); 'Life of Lord Palmerston' (1850), and 'Revolution and Counter-Revolution,' a reprint of a series of letters in the New York Tribune, in regard to the Revolution of 1848 in Germany.

Marx was undoubtedly the founder of the modern socialistic school, in that he first gave definite scientific statement to the principles of modern Socialism. His greatest and best-known work, 'Das Kapital,' is a monument of acute reasoning, extensive reading and knowledge, though excessively long, obscure and tortuous in its meanings. In this he analyzes carefully his theory of value, which is that the measure of the value of a commodity is the amount of labor "socially necessary" to produce it, and shows how under the capitalistic system the laborers are exploited of what they produce over and above their wages (surplus value). These theories were by no means new, though Marx rather confused than elucidated them. He also traces the development of capitalistic production, the growth of the working class or proletariat which is finally to transform or revolutionize society, and lays down the principle that the fundamental factor in the development of society is the method of production and exchange; hence the Socialist movement must simply assist and hasten the changes in progress. Marx was not only a scholar and thinker, but an organizer and agitator of unusual power. (See Socialism). Consult Aveling, 'The Stu-(See Socialism). Consult Aveling, 'The Student's Marx' (London 1892); Deville, 'The People's Marx,' for epitomes of 'Capital' Consult also Böhm-Bawerk, 'Karl Marx and the Close of His System' (New York 1898); Boudin, L. B., 'Theoretical System of Karl Marx in Light of Recent Criticism' (Chicago 1907); Croce, B., 'Historical Materialism and the Economics of Karl Marx' (New York 1914); Spargo, John, 'Karl Marx, His Life and Work' (1b. 1910); id., 'Sidelight on Contemporary Socialism' (ib. 1911).

MARY, the mother of Jesus, is known in the Catholic Church as the Blessed Virgin Mary. The name is from the Gr Μαριάμ (Mariam) or Μαρία (Maria), which in turn is from the Heb. Miryām, a word of uncertain meaning. The New Testament narrative is silent as to her parentage and the place and date of her birth. From tradition and other sources we

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learn that her father was Joachim and her mother Anne, that by them she was presented in the temple at Jerusalem when she was three years old, and that in the temple she remained until the age of 12 or thereabouts Her birthplace is variously stated as being Nazareth, Sephoris (Diocæsarea), or Jerusalem early youth she was betrothed to Joseph, a carpenter, a scion of the house of David. She probably belonged herself to the same royal lineage At all events, she was a cousin of Elizabeth, wife of the priest Zachary and mother of John the Baptist. While Mary was betrothed to Joseph, and before her marriage, she was visited at Nazareth, a city of Galilee, by the angel Gabriel, who announced to her that, by the operation of the Holy Ghost, she should conceive and bring forth a son, to whom was to be given the name Jesus, who should be called the son of the Most High, and who should reign over the house of Jacob forever. The angel also said that her cousin Elizabeth had conceived a son in her old age, and was then in the sixth month of her pregnancy. Mary thereupon visited Elizabeth in the hill country of Judah, and, in response to Elizabeth's salutation, "Blessed art thou among women, and blessed is the fruit of thy womb," she uttered under divine inspiration the glorious canticle of praise known as the 'Magnificat.' The visit lasted about three months. On her return to Nazareth, Mary "was found with child of the Holy Ghost." Joseph, however, was in a dream told by an angel of the true condition of affairs, and, instead of putting her away privately, as was his first impulse, he concluded the ritual marriage with her. Some few months later, in obedience to a decree of Cæsar Augustus prescribing a general enrolment, Joseph went from Nazareth in Galilee to the city of David, Bethlehem in Judæa, because he was of the house and family of David, to enrol himself with Mary, who was then great with child. There was no room for them in the inn, and so in a grotto, which served as a shelter for animals, Mary gave birth to her son On the eighth day afterward the child was circumcised, and was called Jesus, in accordance with the instruction previously given by the angel Gabriel Thirty-three days later Mary complied with the law of Moses (Lev. xii, 2-8) by offering herself in the temple at Jerusalem for legal purification, and at the same time she presented her child to the Lord in accordance with Ex. xui, 2, 12 and Num. On this occasion Simeon proxviii, 15. nounced the canticle of joy known as 'Nunc dimittis.' He told Mary that her child was set for the fall and for the resurrection of many in Israel and for a sign that should be con-tradicted, and that her own soul a sword should pierce. Anna the prophetess, on the same occasion, confessed to the Lord, and spoke of the child to all that looked for the redemption of Israel A great danger threatened the life of Mary's son. Herod the Great, king of Judæa, having seen and questioned the Wise Men who had come from afar to pay homage to the newly-born King of the Jews, whose star they had seen in the East, concealed the alarm which these strange tidings caused him directed the these strange tidings caused him, directed the strangers to Bethlehem as the city indicated by prophecies for the birth of Christ, and adjured them to let him know, on their return to

Jerusalem, where the young king was to be found, so that he too might come and pay him homage. The Wise Men, after offering to the infant Jesus their gifts of gold, frankincense and myrrh, were warned by God in a dream not to go back to Herod, and accordingly they departed by another way into their own country Herod, not hearing from them, was enraged, and issued an order that every male child two years of age and under in Bethlehem and its borders should be put to death. In the mean-time, Joseph, being warned by an angel, had taken the child and his mother and fled into Egypt, and thus the infant Jesus escaped the Slaughter of the Innocents How long the sojourn in Egypt lasted we do not know. What we are told is that Joseph, advised by an angel of the death of Herod, returned to the land of Israel, but, learning that Archelaus was reigning in Judæa in the room of Herod his father, he decided to go, not to Bethlehem, but to Nazareth, and in the latter city the Holy Family took up their abode

The chronology of Matthew and the chronology of Luke, the only evangelists who give an account of the events immediately preceding and immediately following the birth of Christ, are at first sight somewhat confusing, but they are not conflicting, and are quite capable of reconcilement, although in this case, as in so

many others, the reconcilement will not wholly square with the popular belief.

After the return to Nazareth, Mary makes but few appearances in the Gospel narrative. We learn that she and Joseph went every year to Jerusalem at the solemn day of the pasch, and that on one of those occasions they lost Jesus, who was then 12 years old, and did not find him until after a three days' search We next find her at the marriage feast at Cana in Galilee, where Jesus, at her request, performed his first public miracle by changing water into wine. After this she accompanied Jesus to Capharnaum Once the mother and brethren of Jesus sought to speak to him, but could not reach him for the crowd. During the passion, Mary stood by the cross of Jesus on Calvary, and from the cross Jesus commended her to John, who from that hour took her to his own The last mention of her in the New Testament occurs in the Acts of the Apostlesi , 14, where it is written that, between Ascension and Pentecost, the apostles were in an upper room in Jerusalem persevering with one mind in prayer with the women, and Mary the mother of Jesus, and with his brethren After that time we have no certain information as to where she lived, nor do we know when and where she died. One tradition says that she lived with Saint John at Ephesus and died there; another, that she lived and died at Jerusalem Baronius, in his 'Annals,' gives the date of her death as AD 48. In fixing that year he relied on a passage in the 'Chronicon' of Eusebius; but there is grave doubt as to the genuineness of that passage in the 'Chronicon,' and the present tendency is to regard it as a later interpolation. The general, perhaps even universal, belief among Catholics is that after her death Mary's body, as well as her soul, was assumed into heaven; but this bodily assumption has not vet been made a matter of faith The Catholic Church teaches that Mary was conceived with-out original, or racial, sin; that she never comMARY 347

mitted actual, or personal, sin; that she was truly the mother of God, and that she always remained a virgin The doctrine of the Immaculate Conception (qv) was not explicitly discussed until the 12th century; but it is claimed that it is implicitly contained in the teachings of the early Fathers of the Church The festival of the Conception of the Blessed Virgin was certainly celebrated in the Greek Church in the 7th century It was possibly kept in Spain in the same century. It was observed in Ireland as early as 900, in parts of Italy before 1000, and in England, France and Germany in the 12th century Saint Bernard, himself a devout client of Mary, unbraided the canons of Lyons for instituting (1140) such a festival without the sanction of the Holy See He himself did not admit that her conception was sinless Saint Thomas Aquinas, the Dominican, and Saint Bonaventura, the Franciscan, hesitated to accept the doctrine of the Immaculate Conception on the ground that, unless Mary had been at some time one of the sinful, she could not truly be said to have been redeemed by Christ. John Duns Scotus, the Franciscan, put forward, on the other hand, the doctrine of preredemption He held that it was as high a tribute to the merits of Christ to assert that Mary was by Him kept free from all taint of original sin, as to say that she first contracted sin and was subsequently delivered from it This view, at first seriously and even angrily contested, gradually spread, and gathered force and momentum with the progress of time The Council of Trent declared that in its decrees on original sin it did not include "the blessed and immaculate Virgin Mary, Mother of God" At length Pope Plus IX, on 8 Dec 1854, promulgated the Bull, Ineffabilis Deus, in which is given the authoritative definition, as follows. "We define that the doctrine which holds that the Blessed Virgin Mary, from the first unstant of her concern. gin Mary, from the first instant of her conception, was, by a singular grace and privilege of Almighty God, in view of the merits of Jesus Christ, the Redeemer of the human race, preserved from all stain of original sin, is a doctrine revealed by God, and therefore to be firmly and steadfastly believed by all the faithful. The dogma of the Immaculate Conception of the Immaculate Conception of the Immaculate Conception of the Immaculate Conception of the Immaculate Conception of the Immaculate Conception of the Immaculate Conception of the Immaculate Conception of the Immaculate Conception of the Immaculate Conception of the Immaculate Conception of the Immaculate Conception of the Immaculate Conception of the Immaculation of the Immaculat tion is rejected by the general body of Protestantism, by many schismatics, and by the sect known as Old Catholics

Scripture and tradition agree in attributing to Mary the greatest personal sanctity, and there is no dispute that the Church has always held her to be free from the commission of actual, or personal, sin Saint Augustine crystallizes this view when he says ('De natura et gratia,' c. 36) that, out of honor to the Lord he wishes no creation of the says ('De natura et gratia,' c. 36) that, out of honor to the Lord, he wishes no question to be made of the holy Virgin Mary when sin is treated of. Her complete freedom from actual sin is confirmed by the Council of Trent (Sess. VI, can. 23): "If any one say that man, once justified, can during his whole life avoid all sins, even venial sins, unless by a special divine privilege, as the Church holds in regard to the Blessed

In the New Testament Mary is called "the mother of Jesus" (John ii, 1, xix, 25, 26; Acts i, 14) and "mother of my Lord" (Luke i, 43), and there are attributed to her the usual functions of motherhood, namely, conception, gestation,

parturition, and giving suck; but she is not specifically designated "mother of God". The belief that that title was properly her due prevailed, however, in the Church from the beginning. The term $\theta \epsilon o \tau \delta \omega g$ (Lat. $D \epsilon u \rho a r a r a r$ mother of God) was probably first formally applied to her toward the end of the 3d century. plied to her toward the end of the 3d century by theologians of Alexandria It occurs, for example, in the works of Origen It came into common use in the 4th century, being found in the writings of Eusebius, Athanasius, Didymus, and Gregory of Nazianzus As Saint Cyril of Alexandria put it (De Recta Fide ad Regun, c 9), "This name Θεοτόκος was perfectly familiar to the ancient Fathers." Nestorius, however, contended that Mary was not rightfully colled mather of Cod as the week the fully called mother of God, as she was the mother, not of God, but of a mere man. Thereupon the Council of Ephesus (431) laid it down as an article of faith that Mary is really and truly the mother of God. The words of the decree are "If any one does not confess that Emmanuel is truly God and consequently that the holy Virgin is the mother of God (Θεοτόκον, Dei genitricem) — inasmuch as she gave birth in the flesh to the Word of God made flesh, according to what is written: 'The word was made flesh'—let him be anathema." This decree was confirmed by several later Councils, eg., Chalcedon (451) and Constantinople (553). It may be added that this teaching was sanctioned in the English Church, for in the first Book of Common Prayer (1549) Mary is called "mother of Thy Son Jesus Christ our Lord and God," and it is still ac-cepted by many, perhaps most, Anglican divines.

The title ἀεὶ παρθένος (Lat semper virgo, ever virgin, always a virgin), which represents a very early belief in the Church, was incorporated in the Creed by the Fifth Ecumenical Council of Constantinople in 553—"qui de coelis descendit et incarnatus de sancta gloriosa Dei genitrice et semper virgine Maria (ἐκ τῆς ἀγίας ενδόξου Θεοτόκου καὶ ἀειπαρθένου Μαρίας) τῆς ἀγῖας ενδόξου Θεοτόκου καὶ ἀειπαρθένου Μαρίας) natus est ex ea. The doctrine of Mary's perpetual virginity, that is, that she remained a virgin before, during, and after parturition, was further emphasized by the Lateran Council in 649 and by the Sixth Ecumenical Council of Constantinople in 680. It is indisputably orthodox both in the Eastern and the Western Church. It is not accepted by Protectories in general, and has been the object. Protestants in general, and has been the object of severe attack by modern Rationalists and

infidel Bible critics

The principal feasts held in honor of the Blessed Virgin are the Purification, 2 February (14 February in the Armenian Church); the Annunciation, 25 March; the Visitation, 2 July; the Assumption, 15 August; the Nativity of Mary, 8 September; the Presentation of Mary in the Temple, 21 November; and the Immaculate Conception, 8 December (9 December in late Conception, 8 December (9 December in the Eastern Church) There are, besides, many minor feasts, some locally celebrated, and others general

Devotion to the Blessed Virgin has been prevalent in the Church from very early times. It received a fresh impetus from the abovementioned decree of the Council of Ephesus. The relationship of motherhood in which Mary had been declared to stand to God, stamping as authoritative the already existing popular

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belief, made invocation of her as a powerful intercessor with her divine Son a natural corollary, and devotion to her grew apace. In the Middle Ages it was widespread In England it was so common and entered to such an extent into practical life that that country was long known as Mary's Dowry. The prominence which Mary had thus attained in Roman Catholic devotions and in popular estimation produced a reaction among the Reformers. They believed indeed in the birth of Christ from a pure virgin, who was consequently to be honored as His mother; but their fundamental position, that the justification and salvation of sinful man are accomplished through faith in Christ alone, caused them to repudiate the idea of a mediator with the mediator, of any creature coming as intermediary between the soul and Christ The inevitable result, among Protestants, was an immediate dethronement of the mother from her high place as intercessor with her Son, and the immediate or later denial and striking away of some of her proudest prerogatives This change of attitude is made evident, for example, in the first Book of Common Prayer (1549) of the English Church, in which the words of the Sarum rite, "glorious and ever Virgin Mary," are changed to "glorious and most blessed Virgin Mary," and still more evident in the second Book (1552) and in the 15th and 22d Articles of Religion (1553) In some sections the Puritan element in Protestantism carried its feeling against Mary so far as to scrupie the singing of the 'Magnificat,' and to abandon the public use of the Apostles' Creed because her name occurs in it. Even as recently as 1898 this spirit of opposition to any honor or invocation of Mary succeeded in securing the rejection of the 'Stabat Mater' from the 'Church Hymnary' and the removal of the words, "Son of Mary," from one of the hymns. Such extremes, however, brought about another reaction. In the 18th century even the Scottish Church introduced the Virgin into the public services in one of its "Paraphrases," in another restored the use of the 'Magnificat' in metre, and in recent years authorized the singing of it in prose and the recital of the Nicene and Apostles' Creeds. The English liturgy never abandoned these. Further, it retained, and still retains, in its Calendar, among the "Feasts to be observed," several festivals of the Blessed Virgin Many Scottish and English divines have written of Mary in terms of great reverence, tenderness, and beauty.

It may be fairly stated that at no time in the history of the Catholic Church have love of Mary and devotion to her been purer or more extensive and intensive than they are at the present day. The Ave Maria is second only to the Lord's Prayer in frequency of use. The Rosary and the Litany of the Blessed Virgin are recited publicly and privately by millions of persons every day Special hymns composed in her honor, like the 'Ave, maris stella,' the 'Stabat Mater,' the 'Alma Redemptoris Mater,' and the English 'Daily, daily sing to Mary,' are frequently said or sung. At the end of every low Mass three Ave Marias and the 'Salve Regina,' as well as other prayers, are publicly recited in the vernacular by the priest and the congregation. The month of May is dedicated to Mary, and devotions in her honor are publicly conducted every day during

that month Every day in October the Rosary of the Blessed Virgin is publicly recited Every Saturday in the year is specially dedicated to her Sodalities established in her honor exist in every land In all this the Church, following the teaching of the Fathers and the Councils and especially of the Council of Trent (1545-63), always carefully distinguishes between the adoration or supreme homage due to God alone and the reverence that may properly be shown to any of His creatures Epiphanius long ago laid down the rule: "Let Mary be held in honor Let the Father, Son, and Holy Ghost be adored but let no one adore Mary (την Μαρίαν μηδείς προσκυνείτω).» Latria is the name given to the adoration of God; dulia is the name given to the honor shown to the saints or to angels As Mary is above all saints and angels—
"Queen of angels" and "Queen of all saints" she is entitled in her Litany - the degree of weneration shown to her is called hyperdulia, which, while it is greater in degree than dulia, is infinitely below latria and differs in essence from it Not every Catholic knows those words; but every Catholic, no matter how ignorant otherwise, feels and knows the distinction which they connote tinction which they connote

What Christian art owes to Mary it would be well nigh impossible to tell. Painters, sculptors, architects, musicians, and poets have outdone themselves in celebrating her praise (See MADONNA IN ART). Shrines in her honor sprang up everywhere In pre-Reformation England the country was studded with such shrines, the most celebrated being our Lady of Walsingham, in Norfolk Among modern shrines the famous ones of the Holy House of Loreto in Italy, Einsiedeln in Switzerland, Lourdes in France, and Guadalupe in Mexico may be singled out for special mention

It is of interest to note that, by decree of the Sixth Provincial Council of Baltimore (1846, confirmed 1847), the Blessed Virgin Mary, conceived without sin, was chosen as the patron of the United States of America

patron of the United States of America

Bibliography.—The amount of reading matter on this subject is, as might be expected, immense both in quantity and range. The following books may with advantage be consulted on the points with which they deal Locrius, 'Maria augusta Virgo Deipara' (Atrebati 1608); Dudinck, 'Mundus Marianus' (Coloniæ 1644); Riccardi, 'Storia de' Santuarii più celebri di Maria Santissima sparsi nel mondo cristiano' (4 vols., Milano 1840-44); Newman, 'Development of Christian Doctrine' (London 1845); Passaglia, 'De immaculato Deiparæ semper Virginis conceptu. commentarius' (3 vols, Romæ 1854-55); Gousset, 'La Croyance générale et constante de l'Église touchant l'immaculée conception de la bienheureuse Vierge Marie' (Paris 1855); Pusey, 'Eirenicon' (Oxford 1865-69); Bourassé, 'Summa Aurea de Laudibus Beatæ Mariæ Virginis' (13 vols, Paris 1866 et seq); 'Hymns to the Virgin and Child' (E E T. S., ed Furnivall, 1867); Northcote, 'The Celebrated Sanctuaries of the Madonna' (London 1868); 'Mirror of Our Lady' (E. E. T S. 1873); La Fuente, 'Vida de la Virgen María con la historia de su culto en España' (2 vols., Barcelona 1879), Waterton, 'Pietas Mariana Britannica' (London 1879); Jameson, 'Legends of the Madonna' (Boston 1881); Kurz, 'Mariologie' (Ratisbon

1881); Northcote, 'Mary in the Gospels' (London 1885); Lehner, 'Die Marienverehrung in den ersten Jahrhunderten' (2d ed, Stuttgart 1886); Bridgett, 'Our Lady's Dowry' (4th ed, London n.d); Schaff, 'Creeds of Christendom' (New York 1890); Rudniki, 'Die beruhmtesten Wallsfahrtsorte der Erde' (Paderborn 1891); Lee, 'The Sinless Conception of the Mother of God. a Theological Essay' (London 1891), Hurll, 'The Madonna in Art' (Boston 1897); Venturi, 'La Madonna' (Milan 1900); Pimentel, (Historia do culto de Nossa Senhora em Portugal) (Lisbõa 1900); Terrien, (La Mère de Dieu et la 1900); Terrien, 'La Mère de Dieu et la mère des hommes d'après les Pères et la théologie' (4 vols, Paris 1900-02); Ullathorne, 'The Immaculate Conception of the Mother of God' (2d ed, London 1904); Manresa, 'La Virgen Maria en la litteratura Hispaña' (Rome 1905); Kronenburg, 'Maria's Heerlijkheid in Nederland' (Amsterdam 1905-10). Neubert, 'Marie dans l'Église anténi-10); Neubert, 'Marie dans l'Église anténi-céenne' (Paris 1908), Hartwell Jones, 'Celtic Britain and the Pilgrim Movement? (London 1912); Beissel, Wallfahrten zu unserer Lieben Frau in Legende und Geschichte' (Freiburg im Bresgau 1913), Pohle-Preuss, 'Mariology' (Saint Louis 1916).

The principal apocryphal writings relating to Mary are 'Evangelium Jacobi'; 'Liber de infantia Mariæ et Christi Salvatoris', 'De nativitate Mariæ'; 'Evangelium Ps—Matthaei'; 'Historia Josephi fabri lignarii'; 'Evangelium Mariæ'; Ιωάννου του θεολόγου λόγος εἰς τὴν κοίμησεν τῆς θεοτόκου, (Transitus Mariæ)

P. J LENNOX, Professor of English Language and Literature, The Catholic University of America

MARY I, queen of England, known popularly as "Bloody Queen Mary": b London, 18 Feb. 1516; d there, 17 Nov. 1558 She was a daughter of Henry VIII After the death of her mother, Catharine of Aragon, she was declared illegitimate; but was restored to the succession in 1544. She was bred by her mother in the Roman Catholic faith, on which account she was treated with rigor under Edward VI She ascended the throne 16 July 1553, after an abortive attempt to set her aside in favor of Lady Jane Grey (q.v.). One of her first measures was the reinstatement of the Roman Catholic prelates superseded in the late reign. Her marriage to Philip II of Spain, united as it was with a complete restoration of the Catholic worship, produced much discontent. Insur-rections broke out under Cave in Devon-shire, and Sir Thomas Wyatt in Kent, which although suppressed, formed sufficient excuses for the imprisonment of the Princess Eliza-beth in the Tower and the execution of Lady Jane Grey and her husband, Lord Guilford Dudley. England was now formally declared to be reconciled to the Pope; the original laws against heretics were revived, and about 200 perished at the stake, including Cranmer, Latimer and Ridley (qq.v.). Under Philip's influence a war began with France, which ended in the loss of Calais in 1558, after it had been in the hands of the English for above 200 years. This disgrace told acutely upon Mary's already disordered health, and she died after a reign of five years. Consult the 'Life' by Strickland in 'Lives of the Queens of England' (new ed.,

1864-65); Lingard, John, 'History of England' (6th ed, London 1855); Froude, 'History of England' (6th ed, London 1855); Froude, 'History of England'; id, 'The Reign of Mary Tudor' (New York 1910); Stone, J, 'Mary I, Queen of England'; Mullinger, J B, 'Philip and Mary' (in 'Cambridge Modern History,' Vol. II, Cambridge 1904); Hume, Martin, 'Two English Queens and Philip' (New York 1908).

MARY II, queen of England: b. London, 30 April 1662; d there, 28 Dec. 1694 She was the daughter of James, Duke of York, afterward James II She was married in 1677 to William, Prince of Orange, and when the Revolution was effected which dethroned her father, Mary was declared joint-possessor of the throne with her husband, King William, on whom the administration of the government devolved During the absence of William in Ireland in 1600 01 More page 17 land in 1690-91, Mary managed parties at home with extreme prudence, and acted with equal ability as regent in 1693 and 1694. She was strongly attached to the Protestant religion and the Church of England She endowed William and Mary College, Virginia, originally intended for the training of missionaries. See WILLIAM III, and consult Burnet, Gilbert, 'Essay upon the Life of Queen Mary' (London 1695); Doebner, 'Memoirs and Letters of Mary II, Queen of England' (Leipzig 1886); Marshall, 'Kensington Palace in the Days of Queen Mary'; Morris, M, 'Reign of William and Mary' (New York 1910); Grew, E and M S., 'The Court of William III' (Boston 1910); Part P. S. (Five Stuart Princesses) (th 1908) Rait, R S., 'Five Stuart Princesses' (ib. 1908).

THE INCARNATION, MARY \mathbf{OF} French-Canadian Ursuline nun and educator: b. Tours, France, 1599; d. Quebec, 1672. Her maiden name was Guyard and in her 18th year she became the wife of M Martin, but was left a widow with an infant son at 19. She eventually took the veil in the Ursuline Convent at Tours, and in 1639 went to Canada as superior of the convent established at Quebec by Madame de la Peltrie. She was extremely successful in administering the school for girls which the Ursulines opened, impressed all with her strong and beautiful personality, which was emphasized by her fine manners and tall stature, and she is one of the most stately and interesting figures in early Canadian history. She wrote an autobiography. Consult 'Lettres de la vénérable Mère Marie de l'Incarnation' (Paris 1681); Casgrain, 'Life of Mary of the Incarnation' (Montreal 1886); Charlevoix, 'La vie de la Mère Marie de l'Incarnation' (Paris 1724), and her son's life, 'La vie de la vénérable Mère Marie de l'Incarnation' (Paris 1677).

MARY MAGDALEN. See Magdalen; also Mary

MARY STUART (MARY, QUEEN OF Scors), queen of Scotland: b Linlithgow Palace, 8 Dec. 1542; d 8 Feb 1587 at Fotheringay Castle. The only child of James V of Scotland and Mary of Guise, she was proclaimed queen upon his death, 14 Dec. 1542, and was crowned 9 Sept. 1543 at Stirling Castle Negotiations for her hand by the future Edward VI of England came to nothing in spite of the at-tempt to effect the betrothal by force of arms. In 1548, having been betrothed to the French Dauphin, she was sent to Paris, where 10 years

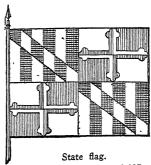
later she married the dauphin, who died in 1560 soon after coming to the throne. Mary returned to Scotland, where her French Catholic training and the new Scottish Reformation made her position a hard one. She diplomatically yielded to the force of circumstances and surrounded herself with Protestant advisers. A match between the Scottish queen and Don Carlos of Spain, heir of Philip II, was all but arranged when Mary, in 1565, met Lord Darnley, her cousin, whom she married July 29, 1565 She had hoped to win by this marriage the English Catholics, with whom Darnley had great influence, and to unite all Catholic claims to the English throne, Darnley (see MARGARET TUDOR) being next in succession to Mary, but her husband's weak ambition made him the tool of the Protestant plot against Rizzio, an Italian favorite of the queen, who was killed March 9, 1566, being brutally dragged from Mary's dining room. Three months later Mary gave birth to a son (later James I of England) She was temporarily reconciled to Darnley, but on Feb. 10, 1567, Darnley's house was blown up and he was killed. Mary had been in the house late the evening before, and the murder was laid to the earl of Bothwell, whom Mary married May 15, 1567. This act turned all the nobles against her, she was forced to surrender to her enemies and on July 24, 1567 to abdicate the crown She was imprisoned in Loch Leven Castle; escaped thence in May 1568; was unsuccessful in her attempt to raise an army; crossed into England, entrusting herself to Elizabeth; and was almost immediately imprisoned. Elizabeth wished to put Mary out of the way, seeing in her a dangerous rival for the English crown, but fear of France and Spain held her back until 1585, while Mary was imprisoned at Tutbury and entrapped into the Babington conspiracy against Elizabeth. Although her complicity was not clearly proved she was beheaded at Fotheringay. The moot point in Mary's tragic history is whether she was a party to Bothwell's assassination of Darnley. That she was is apparently proved by letters from her to Bothwell, which the Scottish nobles declared they found in Bothwell's in they found in Bothwell's jewel-case but the originals of these letters are not to be found, and their authenticity is doubtful The matter is ably discussed in Cowan's Mary, Queen of Scots (1901), and Lang's The Mystery of Mary Stuart (1901). The point at issue is, however, confused by making it depend on the authenticity of these letters, for Mary's guilty knowledge of the plot against Darnley seems indubitable. But her career had more than a personal significance since in her person were combined the last hopes of Catholic rule in England and an intense devotion to Catholicism. Personally she was of a dazzling complexion, apparently her main claim to beauty, marvelously winning, and clever in argument, as was evidenced nowhere more plainly than in her trial for treason.

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MARYBOROUGH. (1) An Australian town in Talbot County, Victoria, about 100 miles north of Melbourne. It contains several factories, machine works and gold mines. Its railroads are of considerable importance on account of its central geographical position. Pop.

(1944) 5,900 (2) Another Australian town in March County Queensland, about 180 miles north of Brisbane It is also a railroad center and a gold mining region The other industries are timber, coal, sugar and sugar refineries, foundries, boot and shoe factories, soap works, sawmills, fisheries, shipyards, etc. Pop. (1945) 14,500.

MARYLAND, mer'i-land, one of the original 13 states of the United States It is bounded on the north by Pennsylvania and Delaware, on the east by Delaware and the Atlantic Ocean. on the south by Virginia and West Virginia, and on the west by West Virginia Maryland was named in honor of Queen Henrietta Maria, wife of King Charles I of England.



9,887 square miles 690 square miles 10,577 square miles Land area Water area Total area 37°53′—39°43′ N 75°4′—79°33′ W sea level to 3,340 feet . . . 1,821,244 s; pop. (1940)—13,069 Latitude Altıtude Population (1940) ' Annapolis; pop. (1940) Ratified the Constitution
Bird
Baltimore oriole, designated 1947

April 28, 1788
Bord
Baltimore oriole, designated 1947 Baltimore oriole, designated 1947
Flower Black-eyed Susan, adopted April 18, 1918
Motto—Scuto Bonae Voluntatis Tuae Coronasti Nos
(With the Shield of Thy Goodwill Thou Hast Covered
Us)

Old Line State, Free State Maryland, My Maryland No official tree Nicknames



State seal: obverse.



State seal: reverse.

Physical Characteristics. — Topography. — The state is divided by Chesapeake Bay into two parts, the Eastern Shore and the Maryland Main or western shore. There are three principal physiographic regions: the coastal plain, the piedmont plateau, and the Appalachian region. The coastal plain encompasses the entire Eastern Shore and the western shore as far inland as the fall line. The fall line may be represented by a line drawn from Washington through Baltimore and Elkton. Between this line and the Blue Ridge Mountains to the westward lies the piedmont plateau. This region, as well as most of the coastal plain, is composed of rich farm lands. The Appalachian region, particularly Allegany and Garrett counties, is rough terrain and not well adapted to agriculture. The highest point in the state is Great Backbone Mountain in Garrett County.

Maryland's geological foundations present a wide spread The state is part of one of the longest exposed areas of the earth's surface. Tertiary formations predominate on the Eastern Shore, Mesozoic and Tertiary on the western shore coastal plain. In the lower piedmont, crystalline rocks of igneous origin prevail; further west Paleozoic rocks are most frequently found. The Blue Ridge is composed largely of Cambrian and Lower Silurian deposits. The main rocks of the Appalachian chain are of Upper Silurian and Devonian formation. Soils on the Eastern Shore are light loam. On the western shore, sandy loam prevails. Western Maryland soils are derived principally from limestone and sandstone.

Rivers.—Both shores of Chesapeake Bay are broken by rivers which are in reality tidal estuaries. The entire course of the Potomac River, except for that portion in the District of Columbia, is in Maryland. The Susquehanna River enters the head of Chesapeake Bay Eastern Shore rivers are the Elk, the Sassafras, the Chester, the Choptank, the Nanticoke, the Wicomico, and the Pocomoke Maryland Main rivers emptying into the bay are the Gunpowder, the Patapsco, the Magothy, the South, the Patuxent, and the Potomac Tributary from Maryland to the Potomac are the Monocacy, Great Pipe Creek, the Antietam, and the Conococheague. The Youghiogheny alone, a tributary of the Monongahela, drains away from the Atlantic.

Climate.—The mean monthly temperature for Maryland varies from 34°F. for January to 75° for July The annual mean is 48°F for the west, 57° for the south, and 54° for the state as a whole Zero temperatures are rare. The state's mildest climate is found in Worcester, the only county facing upon the Atlantic Ocean; and the most rigorous winter climate comes to Garrett, the westernmost county. Average annual rainfall varies from 25 to 55 inches, with most parts of the state receiving 38 inches or more. Average annual snowfall is 66 inches at Oakland and 16 inches in Easton.

Political Divisions.—Cities and Counties.—Baltimore City is the center of Maryland's culture and economy. It is an old city, built largely without plan, and too absorbed with its thriving industry to give adequate attention to its civic and physical needs. It is picturesque and, in many ways, unique. Characteristic are the highly-scrubbed white stone steps of the countless row houses. Baltimore Street has been called the "character" street, and Charles the "quality" street. Mount Vernon Place, a small park in

the middle of Charles Street leading up to the Washington Monument, is as well designed a bit of town planning as one may find. The Washington Monument is a towering monolith with a stairway inside and a gallery at the top. The city is a mecca for those interested in the arts. Early in the last century it rivaled New York as a theatrical center. Today the music department of Peabody Institute, known as the Conservatory, is the center of most musical activity. The Walters Art Gallery, donated to the city in 1931, is one of the best of its kind. The city, as well as the whole state, is noted for its good cookery. Oliver Wendell Holmes dubbed it "the gastronomic metropolis of the Union". The city's metropolitan character is in the clearest evidence when one sees its harbor. Here one has little doubt that he is visiting a great industrial city.

The seat of Baltimore County is Towson, an unincorporated suburb of Baltimore City. There is an intense county consciousness throughout Maryland Near Baltimore the towns are suburban in composition, but many of them are distinctive Ellicott City, built in a narrow valdistinctive Efficient City, built in a narrow valley, reminds one of a European city. Away from Baltimore and Washington, most of the villages are quaint and quiet. The state's second city is built on the mountains where they are divided by the Potomac. The city's economy is sustained by lumber, coal, and the surrounding regions of Maryland, West Virginia, and Pennsylvania Hagerstown, the seat of Washington County and the third city in size, was laid out by Jonathan Hager in 1762. It is in a fertile farming area and contains numerous industries. Near Hagerstown is Antietam Battle Ground National Park Also in Washington County is the place where the Potomac and the Mason-Dixon Line almost meet, leaving the state scarcely two miles wide Frederick and Montgomery counties in central Maryland contain rich farm lands. The town of Frederick boasts the Barbara Fritchie House and the home of Roger Brooke Taney. Thomas Johnson, the first governor of Maryland, lived in Frederick

Prince Georges and Montgomery counties border upon the District of Columbia. The existence of the federal district has greatly stimulated the surrounding areas in Maryland. The towns of Cheverly, Bladensburg, Hyattsville, Riverdale, College Park, Mount Rainier, Takoma Park, Silver Spring, Bethesda, and others are clearly a part of the metropolitan community. Many federal institutions, such as the Naval Academy at Annapolis, the model housing community at Greenbelt, and the Navy Hospital at Bethesda, have contributed marked impetus to economic life Southern Maryland, south from Annapolis and away from the Washington-Baltimore strip development, is the least changed part of the state The people are almost exclusively English in origin, and there is a strong element of old aristocracy. Annapolis, the capital, is one of the most individual small towns in America. Its population, according to one observer, is composed of five parts: state politics, navy, county, St. John's College, and plain townspeople.

The Eastern Shore is a place apart. Its people are vigorous, unbeholden, and keenly conscious of politics. Its economic expansion began when the refrigerator car became practical, and has continued steadily. Salisbury is the principal city and distributing point; it is the region's true

MARYLAND

economic center. Worcester is the ocean county. Ocean City, Maryland's seaside resort, is patronized principally by Marylanders. Cambridge, on the Choptank, is the shore's second city; sizable packing and processing industries are maintained there. Crisfield lays its claim as the "Seafood Capital of the World" Smith Islanders, who inhabit a group of islands off the coast from Crisfield, are individualists par excellence Elkton, near the head of the bay, was formerly known as a place to marry in haste; legislation enacted in 1938, however, requires a notice of 48 hours. The Eastern Shore is connected to the Maryland Main by ferries to Baltimore and Annapolis See back of state map for population of cities and towns

Maryland architecture has been conservative The formal Georgian influence is clearly evident. The ground rent system and other factors have led to the building of numerous row houses in Baltimore and to a lesser extent in other Maryland cities. Throughout the state there are many beautiful old houses One of the best examples of architecture of the period of George III is the Hammond-Harwood house in Annapolis. Another famous old Annapolis house is the Chase Home, built by Samuel Chase in 1769 Doughoregan Manor in Howard County was built by Charles Carroll of Carrollton. A charming piece of architecture is Homewood on the Johns Hopkins campus in Baltimore; it was built by Charles Carroll of Carrollton for his son in 1800 Not far from Easton is Wye House, the leading old house on the Eastern Shore. At Wye Mills in Talbot County is the Wye Oak, estimated to be four hundred years old. Not far way is Wye Chapel, consecrated in 1721. Many other old houses have been preserved on the Eastern Shore and in southern Maryland.

The state's 23 counties and their county seats are as follows:

County Allegany Anne Arundel Baltimore Baltimore City Calvert Caroline Carroll Cecil Charles Dorchester Frederick Garrett Harford Howard Kent Montgomery Prince Georges Oueen Annes St. Marys Somerset Talbot Washington Wicomico	County Seat Cumberland Annapolis Towson Prince Frederich Denton Westminster Elkton La Plata Cambridge Frederick Oakland Bel Air Ellicott City Chestertown Rockville Upper Marlboro Centerville Leonardtown Princess Anne Easton Hagerstown Salisbury
Worcester	Snow Hill

The People.—Only six states in 1940 had a denser population than Maryland. In 1940, 83 4 per cent of the state's population was white and 16.6 per cent was Negro The percentage of other races was negligible. Native born Amerother races was negligible. Inative both Americans constituted nearly 96 per cent of the state's population. Most of the foreign-born lived in Baltimore City and Baltimore County. Of all native Marylanders living in the United States in 1940, 20.4 per cent were living in other states; on the other hand, 25.1 per cent of the residents of Maryland were born in other states. Maryland of Maryland were born in other states. Maryland

population continues to grow; it the 1920's it increased by 12.5 per cent, in the 1930's by 11.6 per cent, and in the first five years of the 1940's by an estimated 17 per cent The percentage of urban residents in 1940 was 59 3 and of rural residents 407

It is difficult to characterize the people of a state in a nation with a population as fluid as that of America And yet the Marylander feels the distinction Perhaps Hulbert Footner in his book, Maryland Main and the Eastern Shore, was right in ascribing this individuality to toleration and tobacco-toleration is traditional in Maryland. and pipe smokers are a mellow sort of men Pride in the state's history, its old houses, and its traditions is everywhere apparent. The spirit of localism is a moving force in Maryland It is not without significance that Maryland's nickname "Free State," originating in the 1920's, has become

widely used

The pattern of Maryland culture clearly was set by the English Besides those of English ancestry, the largest group of Maryland citizens is the Negroes Slavery was a flourishing institution in early Maryland, but its incidence diminished after tobacco ceased to be a profitable crop The leading Maryland abolitionist was William Lloyd Garrison, who published the paper, The Genius of Universal Emancipation, in Baltimore in 1829. Segregation of Negroes is not so general in Maryland as in other places. There is no segregation in transportation. Separate schools are maintained for Negroes. Segregation is effected by custom in housing, restaurants, hotels, and theaters. Negroes play little part in Mary-land politics The proportion of Negroes to total Maryland population is now considerably smaller than it was at the time of the first federal census. Other national stocks which have served as a base for present-day Maryland are the Irish and Germans The Irish settled principally north and east of Baltimore Although Germans came from the earliest days, the greatest numbers arrived in the first half of the 19th century. German immigration, especially to Baltimore and central Mary-land, had a marked effect Indeed, the constitution of Maryland, until amended in 1944, provided for the advertisement of proposed constitutional amendments in a German-language newspaper in Baltimore Other nationalities which have contributed in lesser measure to Maryland are French, Polish, Czech, Italian, Russian, and Lithuanian.

Religion - Although there has been religious toleration in Maryland from the beginning, there have been several developments affecting it. The earliest settlers were Catholics, but toleration for all Christians was the rule. Catholicism was outlawed briefly under the Puritan regime. Church of England was established in 1692, and supported by a poll tax; the established church was continued until 1776, although other religions were tolerated It was during this period that legislation was passed requiring the marriage ceremony to be religious, this requirement continues today (1948). Official religious intolerance finally was dealt its death blow in 1825, when the oath of public office was amended to permit Jews to hold office. The Catholic Church has been strong from the earliest days. The Right Reverend John Carroll was consecrated as bishop of Baltimore in 1789, and his see was raised to an archbishopric in 1808. He was the first prelate to hold episcopal office in the Roman Catholic

Total Population 1,821,244

395	Calvert, (K2)	Derwood, (F4) 152	Graceham, (E2)	7 1 17 1
bell, (H8) berdeen, (K2) 1,525	Cambridge, (K6) 10,102	Dickerson, (E4) 226	Granite, (G3)	Leslie, (L2)
hypodon, (13)	Camp Springs, (G5) 928 Capitol Heights,	Doncaster, (F7) 359		Level, (K2) Lewistown, (E2) 203
enident (A/)	(G5) 2,036	Doubs, (E3) 153 Downsville, (C2)	CHANCHY INC. IN CO.	Liberty Grove, (K2) 216
anakerk (UO)	('ardiff, (J2) 589	Drayden, (J8) 248	Greenshoro (Lt) 139	Libertytown (E3) 639
damstown, (D3) 240 kun, (K2)	Carny, (H3)	Dublin (J2)	t lagerstown a /on-	Lime Kiln. (E3) 171
leave (ICO)	Carrollton, (G2) 150	Larleigh Heights,	, raiccito(pc, ([7]4)	Lineboro, (G2) 123
llen (NI/)	Castleton, (J2) 110	(Fi4)	mail. (G5)	Linkwood, (L6) 79 Linthicum Heights,
merican Corners,	Catoctin, (E2) Catonsville, (E3) 13,565	Earleville, (L3) 122 E New Market, (L6) 267	Hampstead, (G2) 55 Hancock, (B2) 664	(H4) 3 000
(L5)	Cavctown, (D2) 226	Laston, (K5) 4,528	Harmans (HA) 940	Linwood, (F2) 53
ndrews (K7) 231 NNAPOLIS (H5)13,069	Cecilton, (L3) 498	Eastport, (J5) 3,699	Harney, (F2) 220	Lisbon, (F3) 134
manolis Jc. (F14) 162	Cedar Grove, (F4)	Eckhart Mines, (C7) 863	Havre de Grace	Little Orleans, (A2) 107 Loch Lynn Heights,
ntietam. (D5)	Cedartown, (N8) Cedarville, (G6)-	Eldersburg, (G3)	Hebbyille (Ca) 4,967	(A8) 339
nuetam Station,	Centerville, (K4) 1,141	Eldorado, (L6)	Hebron (M7)	Lonaconing, (C7) 2,429
(D3) yuasco, (G6) 88	Chance, (L8) 510	Elk Mills, (L2) 288	Helen (H7) ' 604	Long Creen, (H3) 44
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DELAWARE

County seat

MARYLAND

Total Population 266,50\$

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MARYLAND 361-363

Church in the United States. Maryland church memberships, according to the religious census of 1936, are in some respects unique. Catholics held 362 per cent of the state's church memberships. 36 2 per cent of the state's church memberships, as compared with a national average of 357 per cent. In Baltimore City, 523 per cent of the church memberships were Catholic, and in the small county of St. Marys 87 per cent belonged to that church. The Methodist Episcopal Church was second largest in memberships. The first Methodist services held in the United States were conducted by Robert Strawbridge in Carroll County in 1761 In 1936, 173 per cent of Maryland church memberships were held in the various branches of this church The Lutheran Church is likewise strong in Maryland The German-speaking settlers of the middle 18th century brought this church to the state In 1936, 75 per cent of all Maryland Lutheran church memberships were held in Frederick and Washington counties and Baltimore City. Quite numerous also are Protestant Episcopal church memberships. The Right Reverend Samuel Claggett was consecrated in 1789 as bishop of Maryland, the first Protestant Episcopal bishop in the United States The preponderance of Jewish church memberships are held in Baltimore City and Baltimore County Other sizeable church memberships in 1936 (latest official census) were held in the Presbyterian, Southern Baptist, Evangelical, and Reformed, and Negro Baptist churches. Memberships in the latter were concentrated in Baltimore City

Famous Men and Women—Thomas Stone (Charles County, 1743–1787), Samuel Chase (Somerset County, 1741–1811), William Paca (near Abingdon, 1740–1799), and Charles Carroll of Carrollton (Annapolis, 1737-1832), were all signers of the Declaration of Independence Daniel of St. Thomas Jenifer (Charles County, 1723–1790) was a pre-Revolutionary leader and signer of the Constitution of the United States in 1787 A few of the native Marylanders who made names for themselves in the United States government are: Roger Brooke Taney (Calvert County, 1777-1864), United States attorney general and chief justice of the United States Supreme Court, William Pinkney (Annapolis, 1764-1822), lawyer, statesman, and diplomat; Reverdy Johnson (Annapolis, 1796–1876), constitutional lawyer and diplomat; Charles Joseph Bonaparte (Baltmore, 1851–1921), lawyer, United States attorney general; and William Wirt (Bladensburg, 1772–1834), lawyer, United States attorney general, and also author of the best seller, The Letters of a British Spy.

Among the state's better known outhors were

Among the state's better known authors may be found: Henry Louis Mencken (Baltimore, 1880-), editor and satirist, modern Maryland's most important literary figure; Francis Scott Key (Frederick County, now Carroll County, 1779-1843), lawyer, and author of *The Star-Spangled Banner*; Mason Locke Weems (Anne Arundel County, 1759–1825), clergyman and author, often called Parson Weems; John Leeds Bozman (Talbot County, 1757–1823), historian and lawyer; John Pendleton Kennedy (Baltimore, 1795–1870), novelist; Lizette Woodworth Reese (Baltimore County, 1856-1935), author of autobiographical works and volumes of poetry; Upton Beall Sinclair (Baltimore, 1878-), writer and politician, awarded Pulitzer Prize in 1943 for *Dragon's Teeth*; James Mallahan Cain (Annapolis, 1892-), journalist, author of *The Postman*

Always Rings Twice; Charles Fulton Oursler (Baltimore, 1893-), journalist, playwright, and fiction writer; Frederick Arnold Kummer (Catonsville, 1873–1943), writer of fiction and plays; Ryder Randall (Baltimore, 1839–1908), journalist and song writer, author of Maryland, My Maryland

A few native Marylanders in the field of art are Charles Willson Peale (Queen Annes County, 1741-1827), portrait painter; James Peale (Chestertown, 1749-1831), miniaturist; Raphael Peale (Annapolis, 1774–1825), miniaturist and painter of still life, Charles Yardley Turner (Baltimore, 1850–1918), outstanding muralist; Camelia Whitehurst (Baltimore, 1875–1936), known for her portraits of children; R. McGill Mackall (Baltimore, 1889-), muralist and por-trait painter, and William Henry Rinehart (near

Umon Bridge, 1825–1874), sculptor

Several of the leading figures in American Negro history were natives of Maryland Benjamin Banneker (1736-1806), mathematician, published an almanac in 1792 and became known in Europe as an astronomer Frederick Douglass (1817?-1895), born a slave on an Eastern Shore plantation, became an abolitionist, orator, journalist, and served as minister to Haiti. Harriet Tubman (1821?-1913) was a fugitive slave, abolitionist, and the foremost leader of the Underground Railroad Francis E Watkins Harper (1825-1911) was born of free parents in Baltimore. She was well known as a poet, novelist,

lecturer, and abolitionist leader.
Natural Resources.—Flora.—Wild flowers most frequently found are clematis, honeysuckle, Virginia creeper, trailing arbutus, violets, wild roses, mountain laurel, clover, black-eyed Susan, golden aster, and goldenrod. There is very little virgin timber. Black and white oak and beech are sometimes found in pure stands, but more often in mixed forest. Other trees are poplar, locust, hickory, ash, gum, elm, hackberry, per-

simmon, pine, spruce, and hemlock

Fauna -- Most large mammals have disappeared, although there are perhaps some bobcats and bear in the mountains. Deer, foxes, opossums, raccoons, squirrels, and rabbits are found in various places in the state. The seventeen-year locust and the Japanese beetle are the most destructive insects. The only poisonous snakes in Maryland are the timber rattler and the copperhead The diamondback terrapin is plentiful on the Eastern Shore. Water and shore birds are abundant in the Chesapeake Bay region and many kinds of ducks frequent the state's waters. The Chesapeake Bay retriever, used for hunting waterfowl, is a native Maryland breed. Bald eagles, hawks, herons, and owls are frequently found The principal song birds are the orioles, thrushes, finches, warblers, and whippoorwills.

Minerals.—See section under Production and

Manufactures.

Parks, Forests, and Refuges.—Parks.—Fort McHenry National Monument, with an area of 47 acres, was made a national park in 1925 The Francis Scott Key Monument, near the Fort Avenue entrance to the park, commemorates the birthplace of the Star-Spangled Banner. The Antietam National Battlefield and cemetery, with an area of more than 195 acres, commemmorate one of the most sangunary one-day battles of the Civil War (Sept. 17, 1862). The Catoctin Recreational Area contains approximately 12,000 acres and is a project of the federal government.

The state parks include Fort Frederick (188 acres), erected in 1756 for defense against the French and Indians; Patapsco State Park (1,116 acres), wooded hills and a favorite camping spot. and the Washington Monument State Park (32 acres), which contains a copy of an earlier monument built in 1827 and used as a Union signal station.

Forests—There are no national forests in Maryland, but there are state forests Their names and acreage are Cedarville, 3,510; Elk Neck, 3,762, Green Ridge, 22,016; Pocomoke, 1,732, Potomac, 10,564, Savage River, 17,825; and Swallow Falls, 5,905.

Refuges and Fish Hatcheries .- The Bear Creek Fish Hatchery is run by the state conserva-tion department and stocks Maryland streams with brook and rainbow trout The largest fish hatchery in Maryland is the one located at Lewistown The Patuxent Wildlife Research Refuge is administered by the United States Fish and Wildlife Service and covers about 2,623 acres. Established by the federal government in 1931, Blackwater Migratory Bird Refuge contains approximately 10,500 acres of marsh situated on the Big and Little Blackwater rivers Quail are raised at the Wicomico State Game Farm.

Production and Manufactures.—Agriculture. -There were in 1940, 42,110 farms in Maryland. Of these, 10,994, or 261 per cent, were operated by tenants, and the rest by full owners, part owners, or managers The average size of the 1940 Maryland farm was 99.7 acres, somewhat smaller than that of thirty years before value of the average Maryland farm was \$6,506 in 1940 as compared with \$4,941 in 1910. The in 1940 as compared with \$4,941 in 1910. The staple crop in colonial Maryland was tobacco. Shortly after the Civil War, it declined in relative importance, and now is grown almost exclusively in southern Maryland. The leading acreage in farm plantings for many years has been in corn, although the number of acres declined steadily in the decades before 1940. The second largest acreage is devoted to wheat. Next comes hay, as might be expected in the dairy farm region surrounding large cities. Oats, barley, and rye are also extensively planted in the state. In the vegetable crops, the largest acreage is planted in tomatoes Next in order of acreage planted in 1939 came sweet corn, Irish potatoes, beans, sweet potatoes, peas, canteloupe, water-melons, cucumbers, and spinach. The acreage planted in Irish potatoes declined considerably in The same is the three decades preceding 1940 true of cherries and grapes, while the production of apples and peaches steadily increased. Large quantities of strawberries are raised in the Chesapeake Bay region. There had been a decline since 1910 in the number of horses and sheep raised in Maryland, while the number of cattle and chickens had grown Wool production was reduced by ens had grown Wool production was reduced by more than half in the three decades before 1940 whereas the production of milk and eggs increased

Practically all areas of Maryland are well adapted to farming except the swamp areas of Dorchester County and the mountains of western Maryland. Frederick County (as of 1947) produces more wheat, hay, milk, and livestock. Carroll County leads in corn and poultry. The roll County leads in corn and poultry. The Eastern Shore concentrates on truck farming and canning. Somerset County raises more straw-berries, and Somerset and Worcester produce most of the state's Irish potatoes. Wicomico

County raises more sweet potatoes than any other county. Dairy farming is the principal agricultural pursuit in Baltimore, Harford, and Montgomery counties In general, agriculture in Maryland is profitable. Land is fertile, huge markets are near, and both rail and water transportation are easily accessible All state agriculture agencies are concentrated at the University of Maryland The university's Board of Regents serves also as the state board of agriculture The agricultural experiment station operated by the United States Department of Agriculture at Beltsville is one of the largest of its kind

Fisheries — Seafood is a thriving business in Maryland. Principal fish caught in the bay are shad, menhaden, croakers, sturgeon, and sea trout. Shellfish are oysters, crabs, and clams, ranging in supply in the order named State conservation officials have been concerned with supply and

artificial culture, particularly of oysters.

Forests and Forest Products—There is practically no virgin timber left in Maryland. Lumber and lumber products have definitely contributed much toward the development of the state's economy. There are some hardwoods in Maryland, particularly oak. Chestnut and walnut have

almost disappeared

Mmerals.—Maryland is not a leading state in mineral production. In 1939 Maryland ranked thirty-third among the states in the value of mineral industry products The leading products were coal and sand and gravel, constituting be-tween them 75 per cent of the value of the total product. Other minerals produced were limestone, granite, basalt, sandstone, slate, marble, kaolin, clay, shale, and asbestos Of the 142 active mining concerns in the state, 59 were in Allegany County and 25 were in Garrett County These two countries contain the Maryland coal deposits. Most Maryland coal miners are of native American stock, and there are few typical mining camps. Large mineral industries are located in Baltimore, particularly steel mills and copper smelting and rolling; most of the minerals processed, however, are shipped in from outside the state

Manufactures.—By far the greater portion of Maryland's manufacturing industry is located in Baltimore. There is extensive vegetable canning and processing on the Eastern Shore. Cumberland has a large Celanese plant and a tire factory. In Hagerstown there is an aircraft plant and a sizable machine tool industry. It is in Baltimore that nearly 90 per cent of the state's manufacturing is concentrated. The city's industries, already thriving, received tremendous impetus from the two world wars. Almost every kind of manufacturing has come to Baltimore The Baltimore establishments of the American Smelting and Refining Company (copper), the Bethlehem Steel Company, and the Glenn L Martin aircraft enterprises are among the largest of their kind Shipbuilding, one of the state's earliest industries, still is thriving. Large factories are devoted to oil refining, spice manufacture, sugar refining, meat packing, and canning. Clothing made in Baltimore is sold throughout the nation. A large distillery and a large Western Electric plant are located near the city's outskirts Other products are chemicals, fertilizer, machinery and machine tools, and printing. As in any other thriving metropolis, building and construction concerns employ more persons than does any other branch of industry. In addition to its tremendous factory

product, the city ranks high in the nation as a wholesale and retail mart.

Transportation.-Two factors have largely shaped the development of Maryland's transportation system First is the existence of Chesapeake Bay, which has made available cheap water transportation. Second is the fact that the main line of rail traffic southward from New York transverses the state. Both the Baltimore and Ohio and the Pennsylvania railroads operate main lines from New York to Washington, by way of Baltimore The Baltimore and Ohio also swings west-ward to serve western Maryland. The Western Maryland Railway also serves that section. The Pennsylvania operates down the Eastern Shore. There are many bus lines serving all parts of the state, with all lines converging in Baltimore and Washington. The main airlines serving the state at Washington and Baltimore are Pennsylvania-Central, Eastern, and American At Baltimore, ships can come farther inland than at any other port on the eastern seaboard. Baltimore is the second leading port in the United States. There are ferries plying across the bay, and regular steamboat connections are maintained with Wilmington, Philadelphia, and other ports. The port of Baltimore has some 350 wharves and piers

Economic and Financial Factors.—Banks.-As of June 30, 1947, there were 106 state banks and trust companies. The total assets of these banks were \$916,050,309 79 and the total deposits, \$845,674,692 05 At the same time there were 9 mutual savings banks in operation. Their total assets were \$436,173,535 81 and total deposits, \$391,873,195 00 As of Dec 31, 1946, there was a total of 63 national banks, with total assets of \$753,889,000 and total deposits of \$703,772,000.

Finances.—Following is a statement of finances for the fiscal year 1946-47:

=		
Balance in state treasury,	beginning of	
fiscal year 1946-47 Receipts, all sources, 1946-	\$	33,998,718.47
Receipts, all sources, 1946-	47	93,286,760.21

Total .				\$1	.27,285,478.68
Disbursemer	its, 1946-4	17 .			96,746,063 21
Balance, beg	unning of	fiscal	year 1947-	-48	30,539,415.47
State indebt	edness on	June	30, 1947,	to-	
taled		٠.			16,895,000 00

Taxation.—Tax collection is not centralized. The principal sources of revenue are the income tax, the property tax, racing taxes, licenses, and the sales tax, effective July 1, 1947. There is no poll tax.

Government.—Maryland has been a political entity for over 300 years. Still in use is its capitol building which was built before the Revo-lutionary War. The present constitution, the state's fourth, dates from 1867 By its provisions, the question of a new constitutional convention is submitted to the voters each twenty years. Initiative is not used, and referendum is used only for constitutional amendments and, upon petition, for approval or nullification of any act of the General Assembly not involving an appropriation.

Executive.—The principal policy branches of the government are the governor and the General Assembly. Elections are held in even-numbered years in which there is not a presidential election. The governor is elected for four years and is indefinitely re-eligible. Governor Albert C. Ritchie served for four terms. The governor's inauguration is the second Wednesday in January following his election. There is no lieutenant governor,

succession going to the president of the Senate and the speaker of the House of Delegates. The governor is assisted by an advisory council composed of the principal elected and appointed department heads The governor's veto of legislation may be overridden by a vote of three fifths of the members elected to each house. Although the political and executive capital is Annapolis, the administrative capital is Baltimore. Practically all of the state's extensive administrative establishments are maintained in the larger city.

The	follow	ng 1s	a list	of th	ne state	govern	ors:
	Lords	Prop	RIETARY	OF	Marylan	TD.	

LORDS PROPRIETARY OF MARYLAND	
Cecilius Calvert, 2d Lord Baltimore Charles Calvert, 3d Lord Baltimore Benedict Leonard Calvert, 4th Lord Baltimore Charles Calvert, 5th Lord Baltimore Frederick Calvert, 6th Lord Baltimore	1632-1675 1675-1715 re 1715 1715-1751 1751-1771 1771-1776
Henry Harford	1771-1776
PROPRIETARY GOVERNORS OF MARYLA	
Leonard Calvert	
Thomas Greene William Stone	1634–164 7 1647–1649
Commissioners. Settlers appointed by Parlia	1649 – 1654 3-
mentary Commissioners or by Provincia	.1
Josias Fendall	1654–1658 1658–1660 1660–1661 1661–1675
Philip Calvert	1660-1661
Charles Calvert Cecilius Calvert Thomas Notley Charles, 3d Lord Baltimore Benedict Leonard Calvert William Joseph (president of council) Protestant Associators	1661-1676
Thomas Notley	1676-1679
Benedict Leonard Calvert	1679-1684 1684-1688
William Joseph (president of council)	1688–1689
Protestant Associators Convention of Freemen and John Coode, Con	1689
mander in chief Nehemiah Blakistone	1689-1690
Nehemiah Blakistone	1690-1692
ROYAL GOVERNORS	`
Sir Lionel Copley Sir Thomas Lawrence	1692-1693 1693
Sir Edmund Andros	.1693-1694
Col Nicholas Greenbury	. 1694
Francis Nicholson	.1694 1694–1699
Nathaniel Blakistone Thomas Tench	1699-1702
John Seymour	1702-1704 1704-1709 1709-1714 1714-1715
Edward Lloyd John Hart	1709-1714
Juni Hait	1/14-1/15
Proprendum Commerce (December	
PROPRIETARY GOVERNORS (RESTORED)	
John Hart Charles Calvert	
John Hart Charles Calvert Benedict Leonard Calvert	1715-1720 1720-1727
John Hart Charles Calvert Benedict Leonard Calvert	1715-1720 1720-1727
John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle	1715-1720 1720-1727
John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Samuel Ogle	1715-1720 1720-1727 1727-1731 1731-1732 1732-1733 1733-1742 1742-1747
John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Samuel Ogle Benjamuel Tasker	1715-1720 1720-1727 1727-1731 1731-1732 1732-1733 1733-1742 1742-1747 1747-1752 1752-1753
John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Samuel Ogle Benjamin Tasker Horatio Sharpe Robert Eden	1715-1720 1720-1727 1727-1731 1731-1732 1732-1733 1733-1742 1742-1747 1747-1752 1752-1753
John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Samuel Ogle	1715-1720 1720-1727 1727-1731 1731-1732 1732-1733 1733-1742 1742-1747
John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Samuel Ogle Benjamin Tasker Horatio Sharpe Robert Eden	1715-1720 1720-1727 1720-1731 1731-1731 1731-1732 1732-1733 1733-1742 1742-1747 1747-1752 1752-1753 1753-1769 1769-1777
John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Samuel Ogle Benjamin Tasker Horatio Sharpe Robert Eden The Convention and Council of Safety State Governors of Maryland	1715-1720 1720-1727 1720-1731 1731-1731 1731-1732 1732-1733 1733-1742 1742-1747 1747-1752 1752-1753 1753-1769 1769-1777
John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Samuel Ogle Benjamin Tasker Horatio Sharpe Robert Eden The Convention and Council of Safety STATE GOVERNORS OF MARYLAND Thomas John Lee	1715-1720 1720-1727 1720-1731 1731-1731 1731-1732 1732-1733 1733-1742 1742-1747 1747-1752 1752-1753 1753-1769 1769-1777
John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Samuel Ogle Benjamin Tasker Horatio Sharpe Robert Eden The Convention and Council of Safety STATE GOVERNORS OF MARYLAND Thomas Johnson Thomas J	1715-1720 1720-1727 1727-1731 1731-1732 1732-1733 1733-1742 1742-1747 1747-1752 1752-1753 1753-1769 1776-1777 1777-1779 1779-1782 1782-1785 1785-1788
John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Samuel Ogle Benjamin Tasker Horatio Sharpe Robert Eden The Convention and Council of Safety STATE GOVERNORS OF MARYLAND Thomas Johnson Thomas J	1715-1720 1720-1727 1727-1731 1731-1732 1733-1742 1742-1747 1742-1752 1752-1753 1753-1769 1769-1776 1777-1779 1777-1779 1778-1785 1782-1785 1788-1788
John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Samuel Ogle Benjamin Tasker Horatio Sharpe Robert Eden The Convention and Council of Safety STATE GOVERNORS OF MARYLAND Thomas Johnson Thomas Sim Lee William Paca William Paca William Smallwood John E Howard George Plater James Brice ""	1715-1720 1720-1727 1727-1731 1731-1732 1732-1733 1733-1742 1742-1747 1747-1752 1752-1753 1753-1769 1769-1777 1777-1779 1779-1782 1782-1785 1788-1785 1788-1791
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John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Samuel Ogle Benjamin Tasker Horatio Sharpe Robert Eden The Convention and Council of Safety STATE GOVERNORS OF MARYLAND Thomas Johnson Thomas Sim Lee William Paca William Paca William Smallwood John E Howard George Plater James Brice Thomas Sim Lee John H Stone John Henry John Henry John Henry John Henry John Herer Republican Robert Bowe Robert Bowe Robert Bowe Robert Howard Robert Republican Robert Bowe Robert R	1715-1720 1720-1727 1727-1731 1731-1732 1732-1733 1733-1742 1742-1747 1747-1752 1752-1753 1753-1769 1776-1777 1777-1779 1779-1782 1782-1785 1788-1791 1791-1792 1792-1794 1794-1797 1797-1798
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John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Samuel Ogle Benjamin Tasker Horatio Sharpe Robert Eden The Convention and Council of Safety STATE GOVERNORS OF MARYLAND Thomas Johnson Thomas Johnson Thomas Johnson Thomas Sim Lee William Paca William Smallwood John E Howard George Plater James Brice Thomas Sim Lee John H Stone John Henry Benjamin Ogle John F Mercer Robert Bowie Robert Wright Edward Lloyd Robert Bowie Levin Winder Charles Ridgely of Hampton Charles Goldsborough Samuel Sprigg Samuel Sprigg Samuel Stevens, Jr. Joseph Kent Daniel Martin Anti-Tackson	1715-1720 1720-1727 1727-1731 1731-1732 1732-1733 1733-1742 1742-1747 1747-1752 1752-1753 1753-1769 1769-1776 1777-1779 1779-1782 1782-1785 1788-1791 1791-1792 1792-1794 1794-1797 1794-1797 1797-1798 1803-1806 1806-1809 1811-1812 1812-1815 1812-1818 1818-1818
John Hart Charles Calvert Benedict Leonard Calvert Samuel Ogle Charles, 5th Lord Baltimore Samuel Ogle Thomas Bladen Tasker Horato Sharpe Robert Eden The Convention and Council of Safety STATE GOVERNORS OF MARYLAND Thomas Johnson Thomas Johnson Thomas Johnson Thomas Johnson Thomas Johnson Thomas Johnson Thomas Sim Lee William Paca William Paca William Smallwood John E Howard George Plater James Brice James Brice John Henry Benjamin Ogle John F Mercer Robert Bowie Robert Wright Edward Lloyd Robert Bowie Levin Winder Charles Ridgely of Hampton Charles Goldsborough Samuel Sprigg Republican Samuel Stevens, Jr. Losenh Kent "" Robert Ment "" Republican Republican "" Republican " Republican "" Repu	1715-1720 1720-1727 1727-1731 1731-1732 1732-1733 1733-1742 1742-1747 1747-1752 1752-1753 1753-1769 1776-1777 1777-1779 1779-1782 1782-1785 1785-1788 1788-1791 1791-1792 1792-1794 1794-1797 1797-1798 1801-1803 1801-1803 1806-1809 1809-1811

George Howard	Whig	1831-1833
James Thomas		1833-1835
Thomas W. Veazey	. "	1835-1838
	Democrat	1838-1841
Francis Thomas	"	1841-1844
Thomas G Pratt	Whig	1844-1847
Philip Francis Thomas .	Democrat	1847-1850
Enoch Louis Lowe		1850-1853
Thomas Watkins Ligon	44	1853-1858
Thomas Holliday Hicks	American	1858-1862
August W. Bradford	Unionist	1862-1865
Thomas Swann Unionist, late		1865-1868
Oden Bowie	Democrat	1868-1872
William Pinkney Whyte	2011100100	1872-1874
James Black Groome	44	1874-1876
John Lee Carroll	44	1876-1880
William T. Hamilton	• "	1880-1884
Robert M McLane		1884-1885
Henry Lloyd	• "	1885-1888
Elihu E Jackson	• "	1888-1892
Frank Brown	44	1892-1896
Lloyd Lownes	Republican	1896-1900
John W. Smith	Democrat	1900-1904
Edwin Warfield	Democrat	1904-1908
Austin L Crothers	44	1908-1912
Philips L Goldsborough .	Republican	1912-1916
Emerson C Harrington	Democrat	1916-1920
Albert C Ritchie	Democrat	1920-1935
Harry W. Nice	Republican	1935-1939
Herbert R O'Conor	Democrat	1939-1947
William Preston Lane	Democrat	1947-
William Tieston Pane		

Legislature - The General Assembly meets on the first Wednesday in January of odd-numbered years. Members of both houses serve for four years. There is one senator from each of the 23 counties and from each of the six legislative districts in Baltimore City, a total of 29. The House of Delegates is composed of six delegates from each of the Baltimore City districts and of two to six delegates from each county, a total of 123 The chambers are equal in power, and the governor, especially when he is a Democrat, exercises a substantial leadership in legislative matters. The General Assembly is assisted by the department of legislative reference It is at the service of the governor, any committee or member of the General Assembly, or the head of any state department. Its regular establishment is in the City Hall at Baltimore, where it serves the city as well as the state During legislative sessions it maintains an office in Annapolis to be available for bill drafting. The director of the department is secretary of the legislative council. The legislative council is composed of ten senators and ten delegates who function between sessions of the legislature to study and recommend new legislation. The council's recommendations carry great weight in the assembly, frequently even on controversial issues.

The comptroller and the attorney general are popularly elected. The treasurer is chosen by the General Assembly. Other state administrative officials are appointed. Although there was substantial administrative reorganization under Governor Ritchie in 1922, boards and commissions are still more numerous than is the case in most other states. The state service operates under a merit system of long standing and universal acceptance. There is also an active state planning commission. Budgeting and central purchasing are performed by the department of budget and procurement.

Public Health and Welfare.—Programs in the fields of health and welfare are operated by the state in the counties. Unemployment and industrial accident insurance programs are well devised. Eleemosynary and correctional institutions are concentrated principally in the piedmont and western shore areas.

Courts.—The administration of justice is performed in the 23 counties by seven circuit courts. At the same level in Baltimore City is the su-

preme bench of 11 judges. There are four appellate circuit courts, one of which serves Baltimore City alone, and the high court, the court of appeals at Annapolis Judges are elected for long terms

Elections.—The state is usually (1947) Democratic rather than Republican There have been only two Republican governors of Maryland since 1900, and these for single terms Two counties. Allegany and Garrett, are nearly always Republican There is usually also a strong Republican vote in Anne Arundel, Baltimore, Carroll, Frederick, Montgomery, Somerset and Washington counties Although it does occasionally elect a Republican mayor, Baltimore City is predominantly democratic In President Franklin D. Roosevelt's last campaign, sixteen of the state's twenty-three counties went Republican Of the large counties, only Prince Georges went Demo-cratic. And yet the large Democratic majority in Baltimore City carried the state comfortably for Roosevelt. Of the state's six congressmen, seldom more than one is Republican Both houses of the legislature are traditionally Democratic, although the Republican minority is usually large enough to make itself felt Republican governors find it difficult to accomplish a full measure of legislative leadership Party candidates are nominated in primaries, with run-off primaries in the absence Voting machines are used in of a majority.

Baltimore City

Local—Local government is extensively controlled by the state. Baltimore City, which is not in a county, has the right to draw its own charter, but its logical governmental preserve is frequently invaded by special legislation. Although counties may by an elaborate process draft home rule charters, only Montgomery and Wico-mico have moved in this direction. County government is the usual traditional commission system, except for Anne Arundel, which, in 1947, was authorized to employ a manager Cities as well as counties depend upon the assembly for grants of authority. Greenbelt, the model town, has a manager. Cumberland and a few other smaller towns have the commission form of government. All others have mayor-council systems. Special governmental districts are necessary in the metropolitan areas of Baltimore and Washington (part of which lies in Maryland). Legislation enacted in 1947 definitely started the state along the path of sharing taxes with counties and cities With numerous special exceptions, local government debt is limited by law to a pro-

portion of assessed property valuations.

Education.—Public and Private.—During early colonial years there were no schools in Maryland. In 1694 duties were levied on selected commodities to support free schools. King William School was established at Annapolis in 1696. In 1723 the assembly provided for a grammar school in each county. These were the only state-supported schools until well after 1800. Religious schools, particularly Catholic, were quite numerous from early years. Public schools were organized for Baltimore in 1829 A uniform public school system was provided for the whole state in the constitution of 1864. A compulsory school attendance law was enacted in 1911. Schools are now (1947) administered on a county-wide basis, with state aid forthcoming to maintain a minimum program in each county. The governor appoints county school boards, which in turn select and control the county superintendents.

Baltimore City schools are controlled by a board of school commissioners, which is appointed by the mayor. The state department of education supervises the elementary and secondary schools in the 23 counties and the state teachers colleges at Towson, Frostburg, and Salisbury for white students and at Bowie for Negroes Baltimore City operates the Coppin Teachers College for Negroes. Negro schools are maintained sepanately

There are several well-known private secondary schools in Maryland Some of the boys' schools are the McDonough School, West Nottingham Academy, the Gilman County School and the Boys' Latin School Some of the girls' schools are Hannah Moore Academy, Notre Dame Preparatory School, Bryn Mawr School, Girls' Latin School, Mount Saint Agnes, Roberts-Beach, St Timothy's, Greenwood, and Garrison Forest School. Most of these schools are in and around Baltimore

The Maryland School for the Blind is maintained in the outskirts of Baltimore. The school for the colored deaf and blind is located on the same premises. The Maryland School for the Deaf is located in Frederick.

The first Maryland institution of higher learning, Washington College at Chestertown, was established in 1782 and is still in operation. It was the first college named for George Washington. It granted him the honorary degree of doctor of laws, and another was granted to Franklin D. Roosevelt in 1933 St John's College at Annapolis, which combined with the older King William School, was chartered in 1784. This college undertook in 1937 a revolutionary curriculum based upon the world's great books. It is for men only and is nonsectarian George Washington Parke Custis, Francis Scott Key, and Reverdy Johnson are among its distinguished alumni There are four Roman Catholic colleges in Maryland: in Baltimore are Loyola (1852) and College of Notre Dame of Maryland (1896); and in Emmitsburg are Mount St. Mary's (1808) and St. Joseph's (1909). Western Maryland College was established at Westminster in 1868 In Baltimore is Goucher College for gırls, established by the Methodists as the Woman's College of Baltimore in 1886 It later became nonsectarian.

By far the most distinguished of the private institutions in Maryland is the Johns Hopkins University in Baltimore. It was incorporated in 1867, after being endowed with a bequest of \$3,500,000 by the man whose name it bears Upon his death in 1873, Hopkins left the university and the hospital an additional \$7,000,000. The university has been outstanding in many fields, particularly science, history, political science, and medicine. The medical school has, along with the University of Maryland Medical School, made of Baltimore one of the country's medical meccas The publication of philosophical studies has brought great renown to Johns Hopkins Woodrow Wilson was one of its early fellows. The undergraduate college has never been large. The engineering school receives its major support from state appropriations In exchange, the university gives free scholarships to a certain number of Maryland students Other schools which grant scholarships in exchange for state appropriations are St Johns, Washington, and Western Maryland, mentioned previously, and Charlotte Hall School and St. Mary's Female Seminary, both in St Marys County. The University of Maryland derives from two sources: the University of Maryland, established in 1812, comprising principally the school of medicine which served as a nucleus for the other professional schools arising later, and Maryland Agricultural College at College Park, chartered in 1856 and made the land-grant college in 1862. The two branches were merged by law in 1920, with the main university at College Park and several of the professional schools still in Baltimore

Morgan College in Baltimore was taken over by the state in 1939 and became Morgan State College. It is the state's leading Negro college. Princess Anne College at Princess Anne on the Eastern Shore is the Negro land-grant college. Whereas Morgan State College specializes in teacher-training, Princess Anne emphasizes agriculture, home economics, and the mechanic arts. The Marbury Commission for the study of Maryland higher education adjudged Morgan State College in 1947 to be the most nearly adequate of the Negro schools.

of the Negro schools.
Following World War II, several junior colleges arose in the state. Some of these are Montgomery Junior College at Chevy Chase, Hagerstown Junior College, and Baltimore Junior College. These colleges were organized principally as night schools and made use of high school facilities already available.

Literacy—According to the census of 1940, of the 1,054,688 persons 25 years old and over, 29,702 did not complete any school years. There were 325,893 persons who had completed grammar school, 122,497 who had completed high school, and 50,371 who had completed four years of college or more. The average school years completed was eight. The percentage of persons 25 years old and over finishing less than five years of school was 153

Libraries —In addition to the libraries of the various educational institutions, there are extensive public libraries in Maryland Chief among these is the Enoch Pratt Free Public Library, established in 1882 with a gift to Baltimore City of \$1,200,000 by Enoch Pratt. It has since received large grants of Carnegie funds. It is housed in a magnificent building on Cathedral Street. The leading county library is the Washington County Free Library. Libraries have been authorized in other counties, but not all have been established. The city library in Baltimore has been merged with that of the department of legislative reference in the City Hall.

History.—The first evidence of the possibilities of colonization in Maryland derived from the reports of Capt. John Smith, who left Jamestown in 1608 to explore Chesapeake Bay He found Indians, principally Algonquins, living in the territory which is now Maryland. The leading tribes on the Maryland Main were the Piscataway, the Nanjemoy, and the Patuxent; on the Eastern Shore were the Nanticoke. These tribes were agricultural, living in clearings and raising corn, potatoes, and tobacco. Near the head of the bay lived the Susquehannocks (Susquehanna), of the Iroquois nation Except for occasional raids by the Seneca from the north and later troubles in western Maryland during the French and Indian War, there was never much Indian trouble in Maryland. In general, the Indian was treated well, and the Maryland tribes gradually and peaceably withdrew. After the Smith expedition,

Virginians began trading freely with the Indians in the hay region principally in furs. William in the bay region, principally in furs. William Claiborne, representing a trading company of London, established a trading post on Kent Island Claiborne was active in Virginia politics, and for many years contested the rights of

the Lords Baltimore to Maryland

The 1st Lord Baltimore was Sir George Calvert He retired from active politics because he had become a Roman Catholic, after having served as secretary of state for England. He was interested in establishing a colony in America, and received from the king a grant of land in Newfoundland The rigors of the Newfoundland climate proved discouraging, and the project was abandoned He visited Virginia and was so pleased with it that he besought from the king a grant in the same neighborhood. The territory of Maryland was granted to him in much broader terms than he was ever able to reduce to possession, partially because of conflict with the duke of York over what is now Delaware and with William Penn over the boundary line between the two colonies of Maryland and Pennsylvania. The boundaries of the colony, as stated in the grant, would have run from Watkins Point, at the head of Chesapeake Bay, due east to the Delaware River, up the river to the fortieth parallel, west along this parallel to the meridian of longitude which passed through the headwaters of the Potomac River, south along that meridian and eastward and southward along the southern bank of the Potomac to Cinquack, near the mouth of the Potomac in Virginia, thence due northward to Watkins Point. If these boundaries had been maintained, the cities of Philadelphia and Wilmington and goodly portions of their respective states would now be in Maryland. All Englishmen, under the charter, could move to Maryland and enjoy their rights as free men The charter granted to the proprietor the right to make laws with the consent of the freemen or their delegates He tried originally to exercise the lawmaking power in town meeting fashion; but by 1638 the assembly had assumed the power to initiate laws, and by 1650 a regular bicameral legislature was in operation exercising full legislative powers

The 1st Lord Baltimore died before the charter could be granted, and the charter was granted to his son Cecilius Calvert, the 2d Lord Baltimore, on June 20, 1632 Although Cecilius Calvert never saw Maryland, he supervised its growth confully will be doot by 1675. carefully until his death in 1675 Under the leadership of Leonard Calvert, the brother of Cecilius and the first governor of Maryland, the Ark and the Dove sailed from England in 1633 and landed on St. Clements Island (or Blakistone Island) in Chesapeake Bay on March 25, 1634. This date is celebrated in Maryland as Maryland Day. The two ships carried more than 200 persons, both Catholics and Protestants. The first settlement was made at St Marys in southern Maryland. It became the first capital and remained so for about 60 years, when the capital was moved to Annapolis. The state's first two counties were St. Marys in southern Maryland

and Kent on the Eastern Shore

From the beginning, difficulties beset the proprietor, Cecilius Calvert. Opposition from Claiborne and his settlers on Kent Island and from Virginians, both in the colonies and in England, continued for many years. He never came to America, but in England he worked assiduously

toward the goal of securing the full development of the colony. While he was a Catholic, he sought the establishment of no church and was always disposed to separate church and state. His principal aim was to provide an asylum for persons of his faith In 1649 the assembly enacted the "Act Concerning Religion" guaranteeing re-ligious toleration. The Puritan Revolution caused repercussions in Maryland. Several violent episodes occurred, but they were finally terminated after 1656, when Olivei Cromwell indicated his willingness for Lord Baltimore to keep the colony The general unrest was not settled, however, until Philip Calvert arrived with a new commission as governor from King Charles II, after the Restoration. Charles Calvert, later to become 3d Lord Baltimore, served as governor from 1661 to 1675 He was the first of the proprietors to live in the colony

Meanwhile settlements had spread The fur trade very soon declined in importance, and agriculture took its place. Wheat and corn were important crops, but tobacco early became the staple crop and remained so long after the colomal period was past. Indentured white servants at first did most of the hard labor, but they were gradually supplanted by Negro slaves. A group of Puritans from Virginia settled on the banks of the Severn and established the town of Providence, later to become Annapolis They named their new county Anne Arundel, after the wife of Cecilius Calvert Calvert County was formed in 1654 and Charles County in 1658 Prior to the death of Cecilius Calvert in 1675, the Eastern Shore saw considerable development, with the establishment of Talbot, Somerset, and Dorchester counties. At the head of the bay, Cecil and

Baltimore counties were also formed

Charles Calvert, 3d Lord Baltimore, became proprietor in 1675. His troubles were quite as serious and numerous as those of his father The most perplexing Indian disturbances occurred within his first ten years, with the Susquehannocks, Iroquois, Senecas, and Onondagas A crown patent granted to William Penn in 1681 conflicted with the Maryland grant, precipitating what was to be a long and acrimonious boundary conflict between the two colonies. The duke of York was Penn's patron, and when he ascended the throne in 1685 as James II, Charles' difficulties were intensified. A rebellion in the colony in 1689 displaced the proprietor Shortly thereafter the crown took over political authority, and Maryland became a crown colony; Lord Baltimore's property rights, however, were reserved to him. The first royal governor arrived in 1692 Under the royal government the town of Annapolis became the capital, laws were codified; the lower house of the assembly grew in prestige and power; and the Anglican Church was established and a poll tax of forty pounds of tobacco was levied for its support During this period the proprietor sent as his property agent Charles Carroll, who founded one of Maryland's leading families. The royal regime lasted until 1715, when the colony was restored to the proprietor after Benedict Leonard Calvert succeeded to the title and renounced Catholicism During the royal period two new counties, Queen Annes and Prince Georges, were created and named for the queen and her husband About 1700 the movement toward western Maryland began Tobacco and slavery did not spread westward. Occasional Indian troubles vexed the western settlers. By

1730 a town had been settled on the present site of Cumberland

Benedict Leonard lived only a short while after his succession to the title. His son Charles became the 5th Lord Baltimore and the fourth lord proprietary. Although Charles' proprietorship was presumably identical to that of the first proprietors, the years of public rule had left their mark, and he came to be considered as little more than an absentee landlord. He visited the province in 1732-1733 His son Frederick served as the last proprietor from 1751-1771, he never came to Maryland. In 1723 the General Assembly authorized the establishment of a free school in Catholics were disfranchised and each county repressed for the remaining provincial years. The town of Baltimore was settled on the Patapsco in German settlers penetrated western Maryland from Pennsylvania. Charles' visit to Maryland in 1732 was primarily to settle the perplexing Pennsylvania boundary dispute. His concessions served as a basis for the surveying of the boundary by Charles Mason and Jeremiah Dixon in the years 1762 to 1767. Maryland, throughout its history, lost heavily in boundary disputes Worcester County on the Atlantic was organized in 1742, Frederick County was established in 1748 The conclusion of the French and Indian War marked the end of Maryland's Indian troubles. The last proprietor, Frederick, died in 1771, bequeathing the colony to his illegitimate son, Henry Harford. Harford County was named for him; Caroline County, likewise established before the American Revolution, was named for the wife of Governor Robert Eden.

Agitation for independence was as plentiful in Maryland as elsewhere in the colonies. Maryland was represented at the Stamp Act Congress. Conventions were called to protest against the Townshend Acts; after these laws were repealed, Maryland felt only mild disturbances. With the departure of Governor Eden for a brief visit to England in 1774, the informal protest organization, known as the convention and composed of five delegates from each county, began to assume the proportions of a regular government; it chose delegates to the Continental congresses and appointed a committee of safety vested with interim powers; later it enlisted troops and exercised many other governmental powers. There was considerable loyalist sentiment in conservative Maryland The influential royal governor, Eden, fought valiantly for a losing cause. Advocates of independence centered in Baltimore and Frederick. Principal leaders were Samuel Chase, Charles Carroll of Carrollton, Samuel Tilghman, and William Paca. The Maryland Convention resolved as late as May 1776 that it was not too late to compose differences Late in June, however, the convention authorized the Maryland delegates to vote for independence. Governor Eden left immediately for England. On July 3 the Maryland Convention declared independence and set about the preparation of a state constitu-tion. The Maryland signers of the Declaration of Independence were Charles Carroll of Carrollton, Samuel Chase, William Paca, and Thomas

The convention met to form Maryland's first constitution on Aug. 14, 1776 The constitution was proclaimed, without submission to the voters, on Nov. 8, 1776. The new document provided a bill of rights, a governor's council, a bicameral legislature with a House of Delegates elected an-

nually and a Senate chosen by an electoral college for five-year terms, and a governor chosen annually by the legislature High property qualifications were established for the suffrage and even higher for office holding. The first state governor was Thomas Johnson In 1776, Frederick County was divided into three counties the central county retained the old name, the southern portion became Montgomery County, named for the revolutionary general, Richard Montgomery, and the western portion became Washington County. The new government of Maryland gave full support to the American Revolution Maryland troops were commanded by Gen. William Smallwood. Other famous officers were Gen Mordecai Gist and Col John Eager Howard Dr James McHenry was one of General Washington's aides; he later became secretary of war under Presidents Washington and Adams The bravery of Maryland troops during the revolution earned for the state its nickname, the Old Line State. Maryland refused to ratify the Articles of Confederation until those states claiming western lands agreed to cede their claims to the central government. The Continental Congress met in Annapolis in 1783 and 1784. It was there that General Washington resigned his commission on Dec. 23, 1783, and Congress ratified the treaty terminating the revolution on Jan 15, 1784

Maryland actively supported the move toward a constitutional convention Commissioners from several states met at Annapolis in 1786 and agreed to meet the following year in Philadelphia. Maryland delegates to the Constitutional Convention were Luther Martin, John Francis Mercer, James McHenry, Daniel Carroll, and Daniel of St. Thomas Jenifer. Martin and Mercer refused to sign the Constitution. The other three, however, did sign A Maryland convention elected for the purpose approved the federal Constitution on April 28, 1788. In 1791, Maryland and Virginia ceded to the national government the territory known as the District of Columbia. The Virginia portion of the district was later returned to the state, so that now the entire district is former Maryland territory. In 1796 Allegany County was formed of the western part of Washington County.

In the years following the adoption of the Constitution, Maryland prospered. Commerce grew rapidly. Even the Napoleonic wars and the War of 1812 did little lasting injury to the state's prosperity. After the war with England was over, Baltimore business men concerned themselves with western trade routes, and the Baltimore and Ohio Railroad was established. During the War of 1812, British troops made several landings in Maryland. A sizeable expedition landed on the banks of the Patuxent in August 1814, and moved toward Washington. A battle was fought at Bladensburg, the American forces were routed, and the British proceeded to burn the government buildings in Washington. The British then moved toward Baltimore and tried unsuccessfully to reduce Fort McHenry. It was during this attack that Francis Scott Key, a Marylander held on board a British ship, wrote The Star-Spangled Banner. Fort McHenry has been restored to its appearance as of 1814 and is now a national park.

The assembly enacted a law in 1818 requiring all banks maintaining main offices outside the state to print their bank notes on special taxed paper. This legislation was aimed directly at the

United States Bank. The act was held unconstitutional by the Supreme Court in the famous case of McCulloch v Maryland. William Wirt, a Baltimore lawyer, was nominated for the presidency in 1832 on the anti-Masonic ticket. Carroll County was established in 1836 out of portions of Frederick and Baltimore counties; it was named for Charles Carroll of Carrollton, who, at the time of his death in 1832, was the last surviving signer of the Declaration of Independence. During the presidency of Andrew Jackson, a Maryland lawyer, Roger B. Taney, served as attorney general, secretary of the treasury, and was appointed as chief justice of the Supreme Court He served in the latter position until 1864. A violent contest in state politics in 1837 and 1838 resulted in constitutional amendments providing for popular election of the governor and the Senate and the abolition of the governor's council

Maryland's second constitution was adopted in 1851 and lasted until 1864. It provided few major changes in governmental structure. At the time of its adoption, Howard County was created out of a part of Anne Arundel, and Baltimore City was separated from Baltimore County. In the decade before the Civil War there was considerable unrest in the state, particularly in Baltimore. In 1860 the Baltimore police force was placed under state control, and from that date on the state government has not been reluctant to interfere in the city's affairs

Considerable distress was felt in Baltimore and throughout the state during the Civil War. Maryland was a border state, and its sympathies were clearly divided. Most influential in keeping Maryland officially on the Union side was Reverdy Johnson, one of the nation's leading lawyers for many years and one of Maryland's most illustrious sons. Johnson earlier had served as attorney general under President Taylor and as United States senator. Later he defended President Johnson in the impeachment proceedings brought against the president. Another prominent Marylander of the period was Montgomery Blair, who was postmaster general under Lincoln and who was forced out of the cabinet for political reasons A riotous attack in Baltimore in 1861 upon Massachusetts troops proceeding through the city resulted in several deaths and led to military control of the city throughout the war. Marylanders fought in both armies In 1862 the armies of Generals Lee and McClellan fought the Battle of Antietam in Washington County. The passage of Gen. Stonewall Jackson's troops through Frederick during this campaign gave rise to the poem The Confederate armies Barbara Frietchie. crossed the state again in proceeding to and from the Battle of Gettysburg in 1863, and in 1864 the two armies again met on Maryland soil at the Battle of the Monocacy. During the war James R Randall wrote Maryland, My Maryland to encourage those of Southern sympathies.

In 1864, Maryland's third constitution was adopted; its principal new features were abolition of slavery, a system of public education, and the disfranchisement of Confederate sympathizers. The fourth constitution, adopted in 1867 and still in effect, resembled that of 1864 closely except that it did not contain repressive features. It provides for a popular vote for every twenty years on the question of a new constitutional convention. The constitution established Wicomico County out of portions of Dorchester and Somer-

set In 1872 the western part of Allegany County became Garrett County, named for the president of the Baltimore and Ohio Railroad

Maryland prosperity reached new heights in the postwar period It was the period of political dominance by the transportation interests Arthur Pue Gorman, president of the Chesapeake and Ohio Canal Company, dominated Maryland poli-tics, state and national, from 1880 until his death in 1906. One of the prime battles of the era was over machine or boss politics Continued efforts brought improvement but never complete eradication of this evil The adoption of the Australian ballot in 1890 was a step in the right direction The Baltimore and Ohio Railroad went into the hands of receivers in 1896, but it was returned to its stockholders three years later. In 1896 the state went Republican in the presidential election and all districts returned Republican congress-men President McKinley called to his cabinet as postmaster general, James A Gary, a Balti-more manufacturer. After 1900 machine politics still existed but its importance steadily declined, Charles J Bonaparte of Baltimore served in the Cabinet of President Theodore Roosevelt as secretary of the navy and attorney general. Joseph I France became Maryland's first popularly-elected United States senator in 1912 Maryland's contributions to World Wars I and II, both rultary and industrial, were great The opportunity for a greater share in the war efforts derived in part from proximity to the capital.

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MARYLAND, University of. It dates back to 1807, when the College of Medicine of Maryland was founded in Baltimore In 1812, the state General Assembly authorized the college to take the name University of Maryland and to add a faculty of law A department of dentistry was added in 1882, and a nursing school in 1889. In 1904, the university absorbed the Maryland College of Pharmacy and, in 1923, the Baltimore College of Dental Surgery. The present state university was created in 1920 by merging the University of Maryland with Maryland State College, founded in College Park in 1856. The graduate school, undergraduate colleges, and agricultural experiment station are located in College Park, and the professional schools in Baltimore In 1948, the university plant was valued at \$19,738,349, and the endowment was \$2,587,599. There were 1,426 teachers and 14,067 students, including 3,237 women.

MARYLAND YELLOWTHROAT, one of the most familiar of North American warblers (Geothlypis trichas.) It is about 5.5 inches

in length, migratory, makes a neatly concealed nest on the ground, almost always in a swamp or near a stream, and lays pink-white eggs delicately dotted with red The plumage is bright yellow above, duller toward the tail, wings and tail greenish; under parts nearly white; and a characteristic jet-black mask across the face and on the sides of the head The summer cry is a sharp questioning «What of it? Where'd ye get it?» The genus contains several related and similar species, but the Kentucky warbler (Opornorms) is no longer included.

MARYLEBONE, mar'lïbūn, Saint, a metropolitan borough of London, England, in the northwest quarter It contains Lord's Ground, Middlesex Hospital, University College, Bedford College, Regent's Park and several railroad terminals. Among its famous residents have been Edward Gibbon, Michael Faraday, Charles Dickens and Turner. Its population is 104,222. See London.

MARYSVILLE, Calif, city, Yuba County seat, alt. 61 feet, at the confluence of the Yuba and Feather rivers, on the Northern Pacific; Western Pacific; and Sacramento Northern (electric) railroads, 52m. N. of Sacramento A municipal airport supplements the city's transportation facilities. The surrounding country is predominantly agricultural, with tracts of timber and areas of mineral deposits. The city is a trade center for the farms and orchards that constitute its environment. It engages in the processing of fruits and vegetables. Marysville is the seat of the College of Notre Dame, which has an average enrolment of 250. The public library is well-housed and -stocked. Of the two hospitals, one is privately owned, the other is a county institution. The original city hall, built in 1855, was representative of the brick buildings of its time. Two lodge buildings, and the new city hall are notable. The name Marysville honors Mary Covillaud, wife of one of the founders of the settlement. In 1842 the site of the present city was occupied by a trading post on the California-Oregon Trail. In 1848–49 a townsite was platted; the city was incorporated in 1851. It has a mayor and council. The water, power, and light systems are all privately owned and operated. Pop. (1930) 5,763; (1940) 6,646.

MARYSVILLE, Kans, city and Marshall County seat, on the Big Blue River, the Union Pacific Railroad, and two federal highways; by rail, 81m. NW. of Topeka Located in an agricultural region, it is an active market for dairy products and poultry. It has railroad shops. Marysville was incorporated as a city in 1861. It is governed by a mayor and council. Water, light, and power systems are all privately owned. Pop. (1930) 4,013; (1940) 4,055.

MARYSVILLE, Ohio, village, Union County seat, alt. 999 feet, on the Big Four and the New York Central railroads, and on state and federal highways. It is 28m. by rail NW of Columbus. It is in agricultural country, and dairy products and seeds constitute a large part of its output. It makes brass goods and chairs Local government is administered by a mayor and council. It has a Carnegie library, and is the seat of a state reformatory for women, with 259 acres of land. The place was laid out in 1820. Its people contributed the Log Cabin

symbol and song to the Harrison-Van Buren Presidential campaign of 1840. Pop. (1930) 3,639; (1940) 4,037.

MARYVILLE, Mo., city and Nodaway County seat; alt. 1,036 feet; 45m. N. of St Joseph; on the Chicago, Burlington and Quincy, and the Wabash railroads. It is surrounded by fine farming country, producing grains, dairy products, hogs, and poultry. The city's industrial products are lightning rods, tire chains, tools, and cement blocks. Maryville is a trading center for the northwestern corner of the state. It has a standard public school system and is the seat of the Northwest Missouri State Teachers College, which has a farm cultivated by students in orcharding and agriculture. The school was established in 1905. Settled, as seat of the newly organized county of Nodaway, in 1845, Maryville was named for Mrs. Mary Graham, wife of Amos Graham, who, when there were only half a dozen families in the place, was its oneman government. Pop. (1930) 5,217; (1940) 5,700

MARYVILLE, Tenn., city and Blount County seat; alt. 1,150 feet; 18m SE. of Knoxville; on the Southern; and Louisville and Nashville railroads. It is near the Great Smoky Mountains National Park, in a timber, quarry and farm area producing lumber, tobacco, cattle, grain, marble, limestone, slate, dolomite and sandstone. Maryville College (Presbyterian), founded in 1819 as Southern and Western Theological Seminary, is here. It was rechartered and given its present name in 1842. Sam Houston moved to Maryville in 1807, kept a store here, and taught school near the town. The town grew up around Fort Craig after 1785. It was incorporated in 1790 and named for the wife of Gov. William Blount. Pop. (1940) 5,609.

MARYVILLE COLLEGE, a coeducational institution, founded in 1819, and located at Maryville, Tenn. Athough under Presbyterian control, it is non-sectarian. It comprises some 19 buildings on a 275-acre, campus. It confers the A.B degree only, and gives certificates in music, art, and expression Bible and religious education are emphasized. Annual enrolment approximates about 800.

MARZIALS, Theophile, or Theophilus, English musician b. Brussels, Belgium, 21 Dec. 1850 He was a pupil of music at London of M. L. Lawson and studied also at Paris and Milan. From 1870 he was employed in the British Museum, where he became superintendent of the department of music. He is best known as a vocal composer ('Twickenham Ferry'; 'Three Sailor Boys'; 'Wait till you come to Forty Years'; 'Ask Nothing More'); and he also published 'A Gallery of Pigeons and Other Poems'; 'Pan Pipes' (1904), etc.

MASACCIO, mä-sät'chō, Tommaso, properly Guidi, gwè'dē, Italian painter: b. San Giovanni, Tuscany, 24 Dec. 1402; d. Rome, about 1428. He went while very young to Rome, where he painted in the church of Saint Clemente a series of frescoes, the finest of which represents Saint Catherine and the doctors before Maxentius. In 1421 he was admitted into the guild of the Speziali at Florence. Among the works of Masaccio are the frescoes in the Brancacci Chapel of the Carmine, the 'Expulsion from Paradise'; 'Saint Peter's Sermon';

the Tribute, Saint Peter Baptizing, and the Raising of the King's Son, the last of which was partly painted by Filippino Consult Knudtzon, Masaccio og den florentiniske maleikonst (Copenhagen 1875); Delaborde, Les oeuvies et la manière de Musaccio (Paris 1876), Schmarsow, Masaccio Studien (Cassel, Ger. 1895).

MASAI, mä-sī', an East African race, speaking a language of Hamitic origin, and living in Kenya Colony, east of Lake Victoria. The Masais are men of large stature and fine physique. They are a warlike people and live mostly in military kraals, eating nothing but meat and drinking nothing but milk. The labor is done by women and children. They are to a certain degree nomadic, live in huts constructed of boughs, and enclose their villages with huge thorn fences. Because of the climate they are better clothed than tribes of the warmer regions Consult Thomson, Through Masai Land (London 1885); Hollis, A. C., The Masai. Their Language and Folklore (Oxford 1905); Merker, M., Die Masai, 2d ed. (Berlin 1910)

MASAN, a Korean port at the head of Chinhai Bay on the south coast, with a screen of picturesque hills for background. It has a superb view of the bay, and is considered a salubrious resort. In the 16th century the Korean admiral, Li Shunsin (Yisunsin), defeated the Japanese fleet of Hideyoshi here along the Chinhai Bay. Old Masan is ancient and thoroughly Korean, New Masan is westernized with regularly laid-out streets. Masan is 25 miles by rail from Samnangjin on the main line of Pusan-Seoul, and lies between Pusan (Fusan) and Chinju. Pop. (1946) 82,175.

MASANIELLO, mä-za-nyĕl'lō, the commonly used name of Tommaso Aniello, Italian revolutionist b. Amalfi, 1623?; d. Naples, July 16, 1647. He was a fisherman at Amalfi, and in 1647 roused and led an insurrection in Naples against the Spanish viceroy, the duke of Arcos He was successful and obtained the abolition of unjust taxes and the revocation of an order to establish the Inquistion at Naples The fruit taxes were abolished and the old civic rights restored. But the people soon rose against him, and he was assassinated. An opera, music by Auber, libretto by Scribe and Delavigne, based on his career, was presented in 1829 in England, in English, as Masaniello. Consult Saavedra, La insurrección de Napoli en 1647 (Madrid 1849).

MASARYK, ma'sa-rīk, Jan Garrīgue, Czechoslovak statesman: b Prague, Bohemia, Sept. 14, 1886; d. there, March 10, 1948. Only son of the Czech nationalist leader, Tomáš G. Masaryk (q.v) and an American mother, he was educated in Prague. In 1906, before completing his studies at Charles University, he left Austria to visit the United States, where he studied at Boston University, and worked as an ironworker and pianist in a motion picture theater. As an Austrian subject he was forced to serve in the army through World War I. He joined his father in Prague in 1918 and aided in the establishment of the republic of Czechoslovakia. Chargé d'affaires at Washington in 1919, two years later he became private secretary to Edward Beneš (q.v.). After service in the Ministry of Foreign Affairs, he was appointed minister to

Great Britain in 1925, resigning in 1938 in protest against the French and British surrender at Munich. Reporting his resignation to Lord Halifax, he closed his note with the words "The nation of St. Wenceslas, John Huss, and Thomas Masaryk will not be a nation of slaves" He was appointed foreign minister of the government in exile organized by Beneš in July 1940, and later deputy prime minister. He was still foreign minister at the time of the Communist coup d'état of Feb. 27, 1948. He did not resign, perhaps hoping that the loss of Czech liberties was not irretrievable Six hours after his death. the government announced that he had committed suicide by jumping from a third-floor window of the Foreign Ministry Building Whether his death resulted from suicide or defenestration will perhaps never be known. An elaborate state funeral was decreed The government explained the asserted suicide as motivated by his anguish over the reproaches of anti-Communist friends for remaining a member of a Communist government.

MASARYK, Tomáš Garrigue, first president of Czechoslovakia b. Hodonín, Moravia, Mar 7, 1850, d Prague, Sept 14, 1937 A Slovak by birth and the son of poor parents, he was apprenticed to a blacksmith after receiving an elementary education. Becoming a teacher, he studied philosophy at the universities of Vienna and Leipzig, and in 1879 began lecturing on philosophy at Vienna Professor at the new Bohemian university in Prague (1882), he became noted as an interpreter of modern political and social tendencies and through his efforts to reconcile and reunite Serbs and Croats Elected to the Austrian Parliament in 1891, he boldly criticized the government's policy toward Bosnia-Hercegovina, resigning his seat in 1893 in protest against the negative policy of Czech nationalists. For several years he edited the critical review Athenaeum which he founded in 1883, and later Naše doba (Our Epoch), founded in 1893 He married an American and as a political economist was well known in the United States. His many writings include: Suicade and Modern Civilization (1991). Philip Part (1992) The Philip tion (1881); Blaise Pascal (1883); The Philosophical and Sociological Foundation of Marxism (1898); Russia and Europe (1913); The New Europe (1918), The Making of a State (1925), and his autobiography President Masaryk Tells His Story, recounted by Karel Capek (1935).

Among these historical and philosophical writings, his powerful criticism of Marxian socialism and the great work on Russia and Europe stand foremost. In 1907 he was re-elected to the Austrian Parliament. During the Friedjung trial in 1909 he helped to expose the forgeries upon which Count Aehrenthal based his annexation of Bosnia and Hercegovina. When World War I broke out he remained in Prague until December 1914, when he escaped to Italy and thence to England in time to avoid arrest. He then became lecturer in the School of Slavonic Studies at the University of London. On Dec 6, 1916, the Austrian clerical organ, Reichspost, announced that Professor Masaryk had been sentenced to death in contumaciam for high treason. Meanwhile, the condemned man was rapidly gaining wide recognition among the Allies as the leader of the national struggle for Czechoslovak independence. Together with Dr. Beneš and

Colonel Stefanik, he formed the triumvirate which was ultimately recognized by the Allied governments as the trustee for the future government of Bohemia. In the spring of 1917, Professor Masaryk was called to Russia by Professor Milyukov, but soon realized the hopelessness of the Russian situation and devoted strenuous efforts to organizing the Czechoslovak Army. He preceded this force to Vladivostok and went on to Tokyo and Washington He had several audiences with President Wilson and addressed many public meetings. The Republic of Czechoslovakia was recognized by Italy on April 23, 1918; by Great Britain on Aug. 13, 1918, by the United States on Sept. 2, 1918; and by Japan, Sept 9, 1918 The Declaration of Independence was formally published at Washington on Oct. 18, 1918, and the republic was formally proclaimed at Prague on October 28. The constitution was drafted in Geneva by Nov. 2, 1918. On Nov. 14, 1918, Masaryk was elected first president of the republic. In his first message to the members of the National Assembly on Dec. 26, 1918, in the presence of representatives of the Allied governments, the president expressed the "gratitude and unshakable fidelity" of the republic toward the Allies. He was re-elected president on May 27, 1920, and again in May 1927 and in May 1934. He resigned in December 1935 and was succeeded by Dr. Edward Beneš.

MASAYA, ma-si'a, Nicaragua, town, in the western part, about 12 miles north of Lake Nicaragua and near Masaya volcano, which is 3,000 feet in height. The town is connected by railroad with the ciues of Leon, Managua and Granada. Masaya is situated in an agricultural region, of which tobacco is one of the principal productions. Coffee, sugar and rice are also grown in the vicinity. The inhabitants are mostly Indians Pop. 13,000.

MASBATE, mas-ba'ta, Philippines, an island of the Philippines in the eastern part of the Visayan Sea, south of Luzon and northwest of Samar; greatest length, 82 miles north-west to southeast; width, 45 miles; area, 1,236 square miles It is very mountainous, the central chain being semi-circular in shape, extending from southwest to southeast, and there are several rivers of considerable size. Communication between towns and villages is mostly by water, as there are few roads or even trails. The staple products are sugarcane, cotton, chocolate and hemp; tobacco of a strong quality is also raised. One of the chief industries is that of stock-raising (cattle, horses and hogs); over 1,000 head of cattle are ordinarily shipped monthly to other parts of the Philippines, mostly to Manila. This industry has been menaced in recent years by the rinderpest. Other important industries are the manufacture of sugar sacks from the buri palm, the manufacture of palm mats of superior workmanship and coloring, weaving, lumbering and fishing; there is also an active trade with Manila In March 1901 the island was united with Ticao (140 square miles), Burias (258 square miles) and the small adjacent islands, to form the province of Masbate; area of the whole province 1,732 square miles. Civil government was inaugurated in 1901. The inhabitants are nearly all Visayans, but there are over 2,000 Bicols and about 580 Tagalogs. Pop.

of province 43,000; Masbate and Ticao (qv.) 30,000.

MASBATE, Philippines, a pueblo and the capital of Masbate province, situated in the northeastern part of the island of Masbate on a peninsula dividing Palánog Port from Mobō Bay. It is a port of entry, and has a considerable trade. It has a church, a school and some well-constructed buildings. Pop. 2,900

MASCAGNI, Pietro, pe'ā-trō mas-kān'yē, Italian composer: b. Leghorn, Tuscany, Dec. 7, 1863, d Rome, Aug 2, 1945. He was educated at the Milan Conservatoire and in 1890 his opera Cavalleria Rusticana brought him immediate recognition in the musical world From 1895 to 1903 he was director of the Rossini Lyceum at Pesaro. His songs and ballads became popular and his successful career as a composer was further aided by his operas L'Amico Frita (1891); I Ranizau (1892), Guglielmo Ratchff (1895); Silvano (1895); Zanetto (1896); Iris (1898); Le Maschere (1901); Amica (1905); Isabeau (1911); Parisina (1913); Lodoletta (1917); Il Piccolo Marat (1919), and Nerone (1935) In 1902 he visited the United States on an operatic tour, and in 1911 made a similar trip throughout South America.

MASCAGNITE, mās-kān'yīt, or MAS-CAGNINE, a native sulphate of ammonium, occurring notably at Sasso in Tuscany, where it was discovered by Mascagni, from whom it was named.

MASCARA, Algeria, fortified town and capital of an arrondissement in the province of Oran, 45 miles southeast of the city of that name, at the base of the Little Atlas Range. The town stands on the site of a Roman colony, is surrounded by walls, but has few ancient remains It is purely of the French colonial type. For two centuries down to 1800 it was the capital of a Turkish beylik; in 1832 it became the capital of Abd-el-Kader; in 1835 it was ravaged by the French, but was reoccupied by Abd-el-Kader in 1838 only to fall finally to the French in 1841. Wine, cereals and oil are the principal items of trade. Pop. 28.693.

MASCARENE (mäs-ka-rēn') ISLANDS, a collective name for the islands of Bourbon, Mauritius and Rodriguez, named after Mascarenhas, a Portuguese navigator, who discovered Bourbon in 1545.

MASCARON, Jules, French preacher: b. Marseilles, 1634; d. Agen, 1703 He became a member of the Congregation of the Oratory and soon established a great reputation as a preacher in the provincial cities. He preached at court in 1666 and thereafter he was a favorite of Louis XIV. Mascaron was consecrated bishop of Tulle in 1671 and eight years later was translated to the more important diocese of Agen. He still continued to preach at court and in 1675 delivered his greatest oration at the funeral of Marshal Turenne. His principal sermons were edited by a member of the congregation, Father Borde, in 1704. Consult (Euvres de Mascaron) (Paris 1828)

MASCART, Eleuthère Elie Nicolas, French physicist: b. Quarouble, Nord, 1837; d. 1908. He received his education at the École Normale Supérieure and in 1872 became professor at the Collège de France. From 1878 to 1907 he was director of the Government Central

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MASCHERONIANA. The 'Mascheroniara' of Vincenz' Menti (1754-1826) is an unfinished ope 'i.e. n' in five cantes of terra time. It represents the third of four periods into which Menti's intellectual and artistic life may be would. The first is the period of the Arcalian lyres and the trapedies; the second that of the Bassidiana' (1793), a diatribe against the French Terror; the third, that of the Napileonia piems, the 'Prometeo' (1797), the 'Mascheroniana' (1801) and the 'Bard of the Black Forest' (1806); the fourth (1815-19) that of the 'Austrian' poems, the 'Mystic May,' the 'Return of Astrea', the 'Invitation to Pallas,' the classic translations and the critical works

Monti's permanent and most interesting distinction is that, as a man thoroughly permeated with the culture and mental traits of the Old Régime, he lived through the Revolutionary period without understanding any aspect of it. In the course of his life he assumed with equal sincerity the position of each dominant party. He assailed the Revolution and then accepted it. He hailed Napoleon the liberator, and then Napoleon the despot. Italians like to find in all these gyrations a thread of consistency: the concept of resurrected Italy. Unfortunately, however, Monti also embraced and sang the Austrian restoration.

This mental confusion, not to say moral

This mental confusion, not to say moral perversity, has its counterpart in Monti's poetry. He is fundamentally an Arcadian, who vaguely perceives the emotions and the character of a new age, without visualizing them clearly as an artist and without finding for them an appropriate formal expression. In a sense this makes his poems extremely interesting; for wholly in the Arcadian manner, they are admirably calculated to show the limitations of that manner. The 'Mascheroniana,' which owes its popularity in Italy to its nationalistic spirit, aims to project the miserable Italy of the revolution upon the great Italy of the past and a greater Italy of the future, of which to be sure Napoleon is to be the artisan. Here is a trite theme but one of potentiality. Monti, however, being Monti, transports it into the Arcadian world, a world by itself, apart from, perhaps superior to, any real world. It becomes "literature" through "plot" and "form." As regards plot, Monti invents a vision of the Dante series: to commemorate a friend, he narrates the passing of the soul of Lorenzo Mascheroni, an eminent mathematician, from earth to heaven, bringing him, en route, in touch with the souls of Parini, Beccaria and others. These great Italians discourse on contemporary and past Italian conditions. Critics who like "literature" find, in the elaborate

descriptions here, distinguished merits of vivacity and coloring. Then, as we pass to form, we get a wealth of allusion, classic and Italian, but especially great ingeniousness of metaphor, and a truly remarkable success in cpigram and sententiousness Here, indeed, we find those traits which give Monti kinship with the greatest writers and which by themselves give the 'Mascheroniana' a place in literary history. But that is all. Monti cannot solve the neo-classic paradox: he cannot bring his virtual poetic theme (nationalism or patriotism) The theme remains undeveloped, and the plot and the form without poetic life When Monti, for instance, wishes to denounce Robespierre, he pictures God shuddering on his throne and the angels gracefully hiding very beautiful heads under very beautiful wings All this has nothing to do with Robespierre The vice of neo-classicism is that it works on three parallel lines, one for the "plot," another for the form (figure, allusion, episode, metaphor); and another for the animating poetic emotion And the lines never meet The 'Mascheroniana' is a classic poem, and it died, as a poem, with the school it represents, retaining an historical interest, for its characteristic defects, and as one of the records of Monti's intellectual reversals.

ARTHUR LIVINGSTON

MASCOTS AND HOODOOS, a mascot is a person or thing supposed to bring good luck, while a hoodoo is an influence of evil. Another name for the hoodoo is Jonah, a term originating with superstitious sailors The word mascot was first introduced into literature by means of the comic opera 'La Mascotte' written by Audran, but in France it appears to have been in common use for a long time previously among gamesters and sporting characters. It was used to signify some object, animate or in-animate, which like the luck-penny brought good fortune to its possessor. The word is traced back to the patous of Provence and Gascony, where a mascot is something which brings luck to a household. Etymologically the word is derived from masque (masked or concealed), which in provincial French is applied—as né born with a caul. Such a child was believed to be destined, not only to be lucky himself, but to be the source of luck to others. In most European countries there is a large trade in charms and talismans to bring good fortune.

The term hoodoo is a manifest corruption of African voodooism and is a modified superstitution of the system of terrorism which has been cultivated for years by the voodoo priesthood with remarkable success. There is, however, no scientific foundation for belief in either hoodoos or mascots, any more than there is in a reliance upon dreams and visions. Natural laws are not to be set aside by touching a hunchback or carrying a rabbit's foot in one's pocket. It is a fact, however, that in every age of the world the goddess of chance has been worshipped under one name or another, and modern civilization has not destroyed this cult. The belief in the mascot for luck, or the hoodoo for ill-luck, is an indication of weakness and lack of decision. In the 'Iliad,' when Hector is told that "the birds are against him," and all the omens unlucky, the Trojan hero makes answer:

«Without a bird his sword the true man draws; and asks no omen but his country's cause." See also OMEN; SUPERSTITION

MASCOUTEN, a belligerent tribe of Algonquians, the French Nation du Feu, "Fire Nation," dwelling along the Illinois River. They were at constant warfare with their neighbors, and are first mentioned by the earliest French missionaries as inhabiting southern Michigan, whence, according to the traditions of the Ojibwas and Ottawas, they had been driven by the latter from the region around modern Mackinaw In 1712, united with the Foxes and Kickapoo, they were almost exterminated, first by the French and afterward by the Pottawattomi and their allies The remants migrated westward and are last mentioned in 1779 as living with the Piankishaws and Kickapoos on the Wabash River. The name is derived from Mashkodainsug, "Inttle prairie people," a title now borne by a tribe of Pottawattomi Indians resident in Kansas.

MASEFIELD, John, English poet and dramatist: b. 1875 In his youth he shipped before the mast on the Conway, in which he made several voyages For a time also he was engaged as a farm laborer and in the 90's spent a short time as attendant in a Sixth avenue sa-loon in New York. These early experiences he later turned to account in his literary work. After his wanderings Masefield settled near London and became a regular contributor of prose and verse to the periodicals of the metropolis. He was awarded the Edmond de Polignac prize for poetry in 1912, and made Poet-Laureate in 1930 Masefield won literary fame mainly through his sea ballads and the narrative poems, 'The Everlasting Mercy' and 'The Widow in the Bye Street.' His verse is in-Widow in the Bye Street. His verse is intensely realistic, full of pathos, although the verse form is often crude. His stories for boys represent his best efforts in prose and are reminiscent of Marryat at his best His plays lack technique and are little suited to stage presentation, but give evidence of growing power. sentation, but give evidence of growing power. His works, in addition to those already mentioned, are 'Salt Water Ballads' (1902); 'A Mainsail Haul' (1905; 1913); 'A Tarpaulin Master'; 'Ballads'; 'Captain Margaret'; 'The Tragedy of Nan and other Plays' (1910); 'The Tragedy of Pompey the Great' (1910); 'Multitude and Solitude'; 'The Street of To-day'; 'Poems and Ballads'; 'William Shakespeare'; 'Dauber'; 'The Daffodil Fields'; 'Philip the King' (1914): 'Personal Recollections of John Nauber'; 'The Dandoll Fields'; 'Fillip the King' (1914); 'Personal Recollections of John M. Synge'; 'The Faithful'; 'Sonnets and Poems'; 'The Locked Chest'; 'Melloney Holtspur' (1922); 'Sard Harken' (1924), 'Recent Prose' (1924); 'Odtaa' (1926), etc. Masefield edited 'The Voyages of Captain William Damier' (1906); and prote introductions to 'Hakedited 'The Voyages of Captain William Dampier' (1906); and wrote introductions to 'Hakluyt's Voyages' and 'The Voyages of Marco Polo' The following plays have been produced: 'The Campden Wonder'; 'Nan'; 'Pompey the Great'; 'Sweeps of Ninety-Eight'; 'Philip the King'; 'The Faithful'; 'Mrs Harrison'; 'Good Friday'; 'The Trial of Jesus' (1925).

MASHAM, Abigail Hill, Lapy, confidante and favorite of Queen Anne of England b. London, 1670; d. 6 Dec 1734 A cousin of Sarah Jennings, Duchess of Marlborough, and also related to Robert Harley, Earl of Oxford, she passed from the service of Lady Rivers, thanks

to the influence of the Duchess of Marlborough, into that of Queen Anne, in whose favor she soon displaced her cousin, making every effort to turn the queen from the Marlboroughs and Whiggery to Toryism and even Jacobitism She was married to Samuel Masham in 1707; had him made a baron in 1712; brought her kinsman Oxford into power, but soon turned him out; and, in short, was the power behind the throne, succeeding her cousin Marlborough She retired after Queen Anne's death. She was a plain, homely, red-nosed woman, much bepraised by Swift and accused of vulgarity, meanness and covetousness by the Whigs See Anne, Queen of England.

MASHAM, Samuel Cunliffe Lister, 1st Baron, English inventor: b Calverly Hall, near Bradford, 1 Jan. 1815; d. Swinton Park, York, 2 Feb 1906. In 1838 his father started Samuel and his brother John as worsted manufacturers in a mill at Manningham About 1845 he perfected a wool-combing machine which revolutionized textile processes and made the inventor wealthy. He secured a profit of \$5,000 on every machine sold From 1855 to 1864 he spent huge sums in perfecting a silk-combing machine and at one time was perilously near bankruptcy. The machine was brought out in 1864 and enabled him to produce valuable yarn from the hitherto useless silk waste Masham also perfected a velvet loom for piled fabrics, and after 1878 his income from his inventions exceeded \$1,000,000 annually. He opposed free-trade because the American protective tariff seriously limited his business. He was created 1st Baron Masham in 1891. He wrote 'Lord Masham's Inventions' (1905).

MASHKODAINSUG. See MASCOUTEN.

MASHONALAND, ma-shō'na-land, South Africa, a province forming the northeastern portion of South Rhodesia, between the Zambesi and Matabeleland It consists largely of open plains and table-lands, is well watered by the Umniate and other feeders of the Zambesi and is very fertile. The Mashonas belong to the Kaffir race and were formerly masters of the whole territory between the Limpopo and the Zambesi, but were cooped up within their present territory by the powerful Matabele, whom they were unable successfully to resist. They are a peaceful people, clever as smiths and as weavers of cotton fabrics. The country came under the management of the British South Africa Company in 1890 It is rich in gold, which has been mined here at some remote and unknown period, old workings being still visible, and Mashonaland is with some degree of prob-ability identified with the biblical Land of Ophir. In 1923 it became part of Southern Rhodesia when that country became a British colony. The Umtali and Victoria. Salisbury, Hartley, Gatooma, Umtali and Victoria. Salisbury is connected with Beira, Portuguese East Africa, by a railroad. From Salisbury north another railroad extends 580 miles through Buluwayo to the Victoria Falls, where there is a new bridge over the Zambesi This road is a section of the Cape the Zambesi to Cairo Railway. For the antiquities, anthropology, history, etc., of Mashonaland, consult Bent, J. T., 'Ruined Cities of Mashonaland' (London 1892), Hall, R. N., 'Prehistoric Rhodesia' (Chicago 1910); id., 'Great Zimbabwe' (London 1905); Darter, A., 'Pioneers of Mashonaland' (ib. 1914); Randall-MacIver, D, 'Mediæval Rhodesia' (ib 1906); Selous, F. C., 'Travel and Adventure in South-East Africa' (London 1893); Waal, D. C, 'With Rhodes in Mashonaland' (Cape Town 1896)

MASHPEE, a New England Indian group, originally located in Barnstable County, Mass They were placed on a reservation as early as 1660. At present there are about 200 individuals of pure Indian descent and many more of mixed negro, white and Indian blood.

MASINISSA, mās-i-nīs'a, or MASSI-NISSA, king of Numīdia: b. 238 BC; d. 148 BC He was at first ruler only of the east portion of the country, but latterly of the whole, having, by the help of the Romans during the Second Punic War, defeated Syphax, king of Western Numidia, taking him prisoner with his write, Sophonisba, whose hand had formerly been promised to Masinissa. Masinissa now made her his write, but Scipio Africanus, fearful of her influence, claimed her as a prisoner of Rome. Unable to resist, Masinissa sent her a poisoned chalice, of which she voluntarily drank. Masinissa commanded the Roman cavalry on the right wing at the battle of Zama, which ended the Second Punic War (201 BC). As a reward the Romans gave him the territory formerly held by Syphax In peace he proved himself an efficient administrator and did much to civilize his people. His army and fleet attained large proportions and he made raids into Carthaginian territory. In 150 BC. Carthage made war on him, but with the Romans as his allies, Carthage fell to rise no more Consult Meltzer-Kahrstedt, 'Geschichte der Karthager' (Vol. III, Berlin 1913).

MASK, a covering for the face, often shaped so as to form a rude representation of human or animal features. They have been in use from the most ancient times Among the Greeks they were used, particularly in the pro-cessions and ceremonies attending the orgies of Dionysus. Some ancient masks seem to have been, like the modern ones, merely coverings for the face, but it was more usual for them to cover the whole head, and represent, with the features, the head, hair and eyes. They were at first made of the bark of trees, then of leather, afterward of wood, which the artist fashioned according to the design of the poet. The comic masks were distinguished by a grotesque, laughing countenance; the tragic ones had more dignity, but were sometimes frightful There were also satyr masks and orchestric, or those with regular features, for dancers. They had mostly very large open mouths, within which were metallic bars or other sounding bodies to strengthen the voice of the speaker—a contrivance which was required by the construction and immense size of the old theatres. The mask used at modern masked balls or masquerades is a covering for the head and face made from a light stuff, with which a person may dis-guise himself and remain unknown, or perhaps represent some other character. There are whole and half masks — for example, masks for the nose and the eyes. A death mask is one of plaster made of the face after death See also CARNIVAL; MASQUERADE, and consult Dall, 'Masks, Labrets and Certain Aboriginal Customs' (Washington 1885); Hart, C. H. (ed.), 'Brouwere's Life Masks of Great Americans'

(New York 1899); Fichorini, 'Le maschere sceniche e le figure comiche d'antichi Romani' (1736); MacGowan, Masks and Demons' (1923).

MASKEGON (swamp people), a remnant of a tribe of Indians, part of the old Algonquin stock, who formerly lived by hunting and fishing. They are now in the "swamp region" of Canada, between Hudson Bay and Lake Winnipeg, and are classed with the Cree and Ojibwa people. To some extent they are now engaged in lumbering and a few do some farming. The estimated number of Maskegons is 2,000

MASKELL, William, English theologian b Bath, about 1814; d Penzance, 12 April 1890 In 1836 he was graduated at University College, Oxford, and in 1837 took holy orders. He was named rector of Corscombe, Dorset, in 1842. During his five-year incumbency he made researches in Anglican Church history, the results of which he embodied in 'Ancient Liturgy of the Church of England' (1844); 'History of the Martin Marprelate Controversy' (1845) and 'Monumenta Ritualia Ecclesiæ Anglicanæ' (1846) In 1847 Dr Maskell was appointed vicar of Saint Mary's, near Torquay, and domestic chaplain to the bishop of Exeter. About this time appeared his 'Holy Baptism' (1848) and 'Enquiry into the Doctrine of the Church of England upon Absolution' (1849) Maskell took part with his bishop in the Gorham controversy, and disgusted at the vacillation of the bishops and their attitude on the question of the sacramental grace of baptism, with Manning he went over to the Roman Catholic Church. In 1850 he issued two letters to the Privy Council on 'The Present Position of the High Church Party.' Other works by him are 'Protestant Ritualists' (1872) and 'Ivories, Ancient and Mediæval' (1875) He never took orders 'utility and historical researches

MASKELYNE, măs'kĕ-lin, Nevil, English astronomer and mathematician: b London, 6 Oct 1732; d. Greenwich, 9 Feb 1811. Hz was educated at Westminster School and at Trinity College, Cambridge; devoted himself to astronomy; and in 1765 was appointed astronomer royal and director of Greenwich Observatory. He made careful studies of terrestrial density, introduced into navigation the method of taking longitudes by lunar distances and made many improvements in astronomical apparatus In 1767 he founded the Nautical Almanac. He wrote 'British Mariner's Guide' (1763) and 'Astronomical Observations' (1765).

MASKINONGE, or MUSKELLUNGE, the giant pike (Esox nobilior) belonging to the Esocidæ or pike family. It is found in the Saint Lawrence River, Lake Champlain, the Great Lakes and in the waters of western Canada. This fish is the largest of the pike family and, being predaceous, is not favored in most localities, as other fish soon disappear after its introduction. The name is applied to smaller but closely related species, of which the lake pickerel is one of the most common. The maskinonge reaches a length of from four to eight feet and a weight of from 40 to 100 pounds. It is caught with a hook and being swift and strong and a redoubtable fighter it is highly prized by anglers. Its color is a

dark gray, sides of a silver gray with black spots of unequal size and spotted fins

MASÓ Y MARQUEZ, Bartolomé, Cuban patriot b near Manzanillo, 1834, d 1907 His education was received in France and on his return to Cuba he became a planter, in which avocation he amassed considerable wealth. In the Ten Years' War (1868–78), he espoused the patriot cause and became colonel in the Cuban patriot army. He was made superintendent-general of the treasury and rendered efficient service under the Palma régime. He was imprisoned by the Spaniards after the war, but in 1883 returned to his plantation where he remained until the Insurrection of 1895. In September he became vice-president of the insurrectionary government and two years later became its president. In 1901 he was considered again for the Presidency and opposed Palma. Masó y Marquez opposed the Platt amendment as a denial of Cuban sovereignty and went before the electorate on this platform, but withdrew before the day of election because of alleged fraud in Palma's campaign.

MASOCHISM, a term used in analytic psychology to denote a tendency, usual in infancy and early childhood but outgrown or sublimated in later life, to take pleasure in having pain inflicted upon oneself. The term is derived from von Sacher-Masoch, an Austrian novelist, in whose stories many of the main characters exhibited this trait in an excessive degree A mild degree of masochism is evinced by many average men and women, particularly those who spend much of their time complaining about wrongs, injuries, pains, etc., suffered by themselves, the inference being that their unconscious masochism drives them to be occupied mentally with pain and the de-tails of its effect upon themselves. Many of the temperamental pessimists of the world afford examples "of an imperfectly sublimated masochism (see Sublimation), and if preponderating in the characterological make-up of the individual suggests a certain degree of disease, which it would be most advisable for such persons to get rid of.

MASON, ma'son, Alfred Edward Woodley, English novelist: b. 7 May 1865. He was educated at Oxford and among his works, the majority of which have been reprinted in the United States, are 'A Romance of Wastdale' (1895); 'The Courtship of Morrice Buckler' (1896, dramatized 1897); 'The Philanderers' (1897); 'Lawrence Clavering' (1897); 'Miranda of the Balcony' (1899, dramatized in New York 1901); 'The Watchers' (1899); 'Clementina' (1901); 'The Four Feathers' (1902); 'The Truants' (1904); 'The Broken Road' (1907); 'The Turnstile' (1912); 'The Four Corners of the World' (1917); 'The Summons' (1920); Running Water' (play, 1922); 'The Winding Stairs' (1923); 'The House of the Arrow' (1924); 'The Prisoner in the Opal.'

MASON, Charles, English astronomer and surveyor b. England, about 1730; d. Philadelphia, February 1787. He was for years assistant astronomer at the Greenwich Observatory and was sent on various expeditions in the service of science. In 1763 he was employed with Jeremiah Dixon to survey the boundary line between Maryland and Pennsylvania and they were engaged in this undertaking until

1767, the line established becoming famous in American history as the "Mason and Dixon's Line" They returned to England and Mason was thereafter engaged in astronomical observations and researches until the time, the precise date of which is not known, when he returned to America His work upon the lunar tables of Tobias Mayer which were published in London in 1787 under the title 'Mayer's Lunar Tables Improved by Charles Mason,' enjoyed a high reputation for reliability In 1860 many of his papers were accidentally discovered at Halifax, N S Consult Bliss, Porter C (in Historical Magazine July 1861).

MASON, Daniel Gregory, American composer and writer on music: b. Brookline, Mass, 20 Nov. 1873 In 1895 he was graduated at Harvard University; he studied music in Boston, New York and Paris He is assistant professor of music at Columbia University and is well known as a lecturer on music His compositions include an elegy for piano (1901); sonata for violin and piano (1912); pastorale for violin, clarinet and piano (1913); and 'Country Pictures' for piano (1913); quartet for piano and strings (1914); symphony (1915); 'Russians' (1917); 'String Quartette' (1918); 'Prelude and Fugue' (1919) He has published 'From Grieg to Brahms' (1902); 'Beethoven and his Forerunners' (1904); 'The Romantic Composers' (1906); 'Students' Guide to Music' (1909); 'Guide to Music' (1914); 'Contemporary Composers' (1919).

MASON, Francis, American missionary and Orientalist b York, England, 2 April 1799; d. Rangoon, Burma, 3 March 1874 He was the son of a shoemaker; studied by himself; came to the United States in 1818; worked as a shoemaker through Massachusetts; prepared for the ministry at Newton Theological Seminary; joined the Baptist Church in 1825; and in 1827 was licensed to preach, sailed for Burma in 1830; and settled in Tavoy, where he worked for 22 years. He was a brilliant linguist; reduced two Karen dialects to writing; and in 1853, upon his removal to Toungoo, published a Karen version of the Bible He made special study of Pali literature and of physical and ethnical peculiarities of Burma, publishing in 1852 'Tenasserim, or the Fauna, Flora, Minerals and Nations of British Burma and Pegu' (revised 1860; 3d ed, 2 vols., by Th'obald 1883). His other works include 'Life of the Karen Apostle,' a memoir of his wife (1847); 'Memoir of San Quala' (1850); 'Pali Grammar' (1868); and 'The Story of a Workingman's Life, with Sketches of Travel,' an autobiography (1870).

MASON, George, American statesman: b. Stafford (now Fairfax) County, in the "Northern Neck" of Virginia, 1725; d. 7 Oct 1792. He spent his early life on a typical plantation. The same region produced his coworkers in the cause of the American Revolution, Richard Henry Lee and George Washington (qq.v.). Mason seems to have been tutored at home, being grounded in a knowledge of the classics, both Latin and English His younger brother, Thomas, was sent to London to study law at the Middle Temple George Mason was married in 1750 to Ann Eilbeck, who died in 1773. Of this union there were several children. He was married again in 1780 to Sarah

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Brent. The family, after 1758, resided at "Gunston Hall," in Stafford County, a famous seat still standing on the banks of the Potomac H1s energies were given to extensive planting interests

As a member of the Ohio company, he was identified with his neighbor, George Washington, in the initial stages of the French and Indian War, growing out of the concerns of that company. In 1759 he entered the Virginia house of burgesses, at the same time with Washington He early protested against slavery In 1765 he wrote: "The policy of encouraging the importation of free people and discouraging that of slaves has never been duly considered in this colony, or we should not at this day see one-half of our best lands in most parts of the country remain unsettled and the other cultivated with slaves; not to mention the ill effects such a practice has upon the morals and the manners of our people." He drafted the "Non-Importation Association," which George Washington presented in 1769 in Williamsburg, and the "Resolves" adopted at a general meeting of the freeholders of Fair-fax County, 18 July 1774 These "Resolves" fax County, 18 July 1774 urged "that a Congress should be appointed to consist of deputies from all the colonies, to concert a general and uniform plan for the defense and preservation of our common rights"; and "that during our present difficulties and distress, no slaves ought to be imported into any of the British colonies on this continent; and we take this opportunity of declaring our most earnest wishes to see an entire stop forever put to such a wicked, cruel and unnatural trade. Sparks says of these Fairfax resolves that "they constitute one of the ablest and most luminous expositions of the points at issue between Great Britain and the colonies which are to be found among the public documents of that period Embracing the great principles and facts, clothed in a nervous and appropriate style, they are equally marked with dignity, firmness, intelligence and wisdom" These "Resolves" served as the basis of the association formed by the Virginia Convention of August 1774 and that of the general Congress at its first session the following September.

He was a member of the Virginia Convention held in Richmond, July 1775, which took measures to arm the colony and appointed a committee of safety. He declined appointment in Congress as Virginia's representative in the seat made vacant by Washington's acceptance of the command of the American forces. The mind of Mason was dominant in the Virginia Convention of 1776, so creative in State and National policies. He was the author of the Virginia Declaration of Rights, adopted by the convention on 12 June 1776 (See Virginia Convention on 12 June 1776 (See Virginia George Mason, is to be seen in the Virginia State Library. At the foot of the manuscript the author added these words: "This Declaration of Rights was the first in America; it received few alterations or additions in the Virginia Convention (some of them not for the better), and was afterward closely imitated by the other United States." The small table upon which it is believed Mason wrote this "Declaration" is preserved at the

Virginia Historical Society in Richmond Mason's chaste and concise statement of the fundamental principles of free government deserves to rank with the foremost political charters of the English-speaking world. James Madison styles him "the master-builder of the Constitution" of Virginia, adopted 29 June 1776, the natal day of the commonwealth

Mason was a member of the Virginia assembly from 1776 to 1780, and from 1786 to 1788. He was one of the committee to revise the laws of Virginia, in accordance with the changed political conditions. The other members of this committee were Thomas Jefferson, Edmund Pendleton, George Wythe and Thomas Ludwell Lee. Mason again declined a seat in Congress, to which he was elected by the Virginia assembly from the committee were the seat of the congress, to which he was elected by the Virginia assembly from 1786 to 178

ginia assembly on 22 May 1777

Mason took an active part in the Constitu-tional Convention of 1787, reaching Philadel-phia 17 May He urged that the President be elected by Congress, and that he be ineligible for a second term; that the States should have equal representation in the Senate, that the Supreme Court should be joined with the Executive in the exercise of the veto power; that Congress be empowered to enact sumptuary laws; "that no law in the nature of a Naviga-tion Act be passed before the year 1808, with-out the consent of two-thirds of each branch of the Legislature"; and, finally, that Congress should be given the control of slavery. Madson reports Mason's speech in favor of giving Congress the control of slavery as follows "This infernal traffic originated in the avarice of British merchants The British government constantly checked the attempts of Virginia to put a stop to it. The present question concerns not the importing States alone, but the whole Union. Slavery discourages arts and manufactures. The poor depise labor when performed by slaves They prevent the emigration of whites, who really enrich and strengthen a country. They produce the most pernicious effect on manners. Every master of slaves is born a petty tyrant. They bring the judgment of heaven on a country. As nations cannot be rewarded or punished in the next world, they must be in this By an inevitable chain of causes and effects, Providence punishes national sins by national calamities. He lamented that some of our eastern brethren had, from a lust of gain, embarked in this nefarious traffic... He held it essential in every point of view, that the General Government should have power to prevent the increase of slavery"

It was chiefly the failure to insert his views as to Congressional control of slavery and Navigation Acts which led Mason to reject the Constitution. Shortly before his death he told Thomas Jefferson that "the Constitution as agreed to for a fortnight before the Convention rose was such a one as he would have set his hand and heart to . . With respect to the importation of slaves, it was left to Congress. This disturbed the two southernmost States who knew that Congress would immediately suppress the importation of slaves. Those two States, therefore, struck up a bargain with the three New England States, that if they would join to admit slaves for some years, the two southernmost States would join in changing the clause which required two-thirds of the Legislature in any vote. It was done

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. Under the coalition, the great principles of the Constitution were changed in the last days of the Convention. Such was Mason's own explanation of his refusal to sign the instrument in Philadelphia and for his stalwart opposition to its ratification in the Virginia Convention, which met at Richmond in 1788. Two years later he declined an appointment to a vacancy in the United States Senate. He died at "Gunston Hall," where he lies buried Mason's statue forms one of the circle of the Revolutionary fathers surrounding the equestrian monument of Washington at Richmond

Thomas Jefferson described George Mason as "a man of the first order of wisdom among those who acted on the theatre of the Revolution, of expansive mind, profound judgment, cogent in argument, learned in the lore of our former Constitution, and earnest for the Republican change on Democratic principles His elocution was neither flowing nor smooth, but his language was strong, his manner most impressive and strengthened by a dash of biting cynicism when provocation made it seasonable. Consult Rowland, 'Life and Writings of George Mason' (2 vols, New York 1892)

MASON, James Murray, American legislator b Mason's Island, Fairfax County, Va, 3 Nov 1798; d near Alexandria, Va, 28 April 1871 He was graduated from the University of Pennsylvania in 1818, studied law and upon being admitted to the bar established a practice at Winchester, Va He was in public office much of the time and in 1847 was elected to the United States Senate, representing Virginia, where he proved a consistent and strong adherent to the policies favored by his State. He was the author of the Fugitive Slave Law of 1850 and at the outbreak of the Civil War he resigned his seat in the Senate to enter the service of the Confederacy He was sent to England with Slidell as Confederate commissioner, but was captured on the steamer Trent (see Trent Affair, the) and taken to Boston where he was confined in Fort Warren until 1862 when he sailed for Europe and until the end of the war endeavored to secure recognition of the Confederacy. After the war Mason lived in Canada until 1868, being in fear of the Federal government, but returned to Virginia some years before his death

MASON, Jeremiah, American lawyer and politician b Lebanon, Conn., 27 April 1768; d. Boston, 14 Oct. 1848 He was graduated at Yale in 1788, admitted to the bar in 1791, and began to practise law at Westmoreland, N. H. In 1794 he removed to Walpole, N. H., and in 1797 settled at Portsmouth, where he lived for 35 years. At the New Hampshire bar, then the most famous in the country, Mason soon reached pre-eminence, among his fellow members being Daniel Webster and Jeremiah Smith In 1802 Mason was appointed attorney-general of New Hampshire and in 1813 became a United States senator. He was a strong Federalist and took a leading part in the senatorial debates on matters relating to the War of 1812, his speech on the Embargo, delivered in 1814, and that on the Conscription Bill, 1815, being notable among public utterances of the time In 1817 he resigned his seat to resume his practice, but afterward served for several terms as a member of the New Hampshire legislature

and rendered great assistance in the codification of the State laws. He removed to Boston in 1832 and practised in the courts until he reached 70, when he retired, with reputation fully maintained, to the more private work of his profession

MASON, John, American colonist, founder of New Hampshire: b King's Lynn, Norfolk, England, 1586, d London, December 1635. In 1610 he served in the navy against insurgents in the Hebrides, in 1616 went as governor to Newfoundland, of which, in 1620, he published a description and in 1626 a map In 1617 he explored the coast of New England; obtained in 1622 a grant of region called Mariana (northeastern Massachusetts); in the same year, with Sir Ferdinando Gorges, procured a patent for the province of Maine; and in 1623 sent a colony to the Piscataqua River. In 1629 he obtained a patent for the New Hampshire colony, also taking one with Gorges for Laconia, a tract including Lake Champlain Among various prominent positions which Mason held in England was that of judge in Hampshire 1635, and in the same year he was appointed vice-admiral of New England In 1691 his rights in New England were sold to Gov Samuel Allen. Mason was buried in Westminster Abbey. New Hampshire became a royal province 44 years after Mason's death. Consult Tuttle, 'Memoir of Captain John Mason, the Founder of New Hampshire,' in an edition of Mason's description of Newfoundland (Boston 1887)

MASON, John, American colonial commander b in England, about 1600; d Norwich, Conn, 1672. Under Sir Thomas Fairfax he served in the Netherlands; in 1630 settled at Dorchester, Mass; in 1633 was appointed to a military command at Boston; and two years later joined with others in founding Windsor, Conn In 1637 he was given command of an expedition of English and Indians against the Pequots (q v), whom he almost annihilated, completing their destruction in a second movement a little later. He removed first to Saybrook, and afterward to Norwich. For 30 years he was a major of the Connecticut forces, was a magistrate for many years and deputy governor 1660–70 From 1642 to 1668 he served as judge of the colonial court. His 'Brief History of the Pequot War,' written at the request of the General Court, was reprinted by Increase Mather in his 'Relation of Trouble by the Indians' (1677, republished by Prince, Boston 1736). Consult Ellis, G. E., 'Life of John Mason of Connecticut' (in Sparks' Library of American Biography,' Vol. XIII, Boston 1864).

MASON, John Mitchell, American diviner b. New York, 19 March 1770; d there, 26 Dec. 1829. His father was pastor of an Associate Reformed Church, and the son was graduated at Columbia College in 1789, and after studying theology under his father's care for one year went in 1791 to the University of Edinburgh. He was recalled in 1792 by intelligence of his father's death, and became his successor in his pastoral charge in 1793 He planned a theological seminary to be under the authority of his denomination, and visited Great Britain for the purpose of obtaining contributions; his pulpit efforts abroad gaining him repute there as one

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of the first preachers of the time. The seminary being established in New York City in 1804, he was appointed its first professor of theology. In 1806 he projected the Christian's Magazine, which he conducted for several years and in which he carried on a controversy with Bishop Hobart. In 1811 he became provost of Columbia College, and by his talents and energy raised that institution to a higher character than it had ever before possessed. In 1821 he exchanged his pastorate for the presidency of Dickinson College, Carlisle, Pa, and the next year entered the Presbyterian ministry. He was one of the great pulpit orators of his day and his discourses on the deaths of Washington (1800) and Hamilton (1804) are masterpieces of their kind. Consult the 'Life,' by Van Vechten (New York 1856).

MASON, John Young, American politician b Greensville, Sussex County, Va, 18 April 1799; d Paris, 3 Oct. 1859 He was educated at the University of North Carolina; was admitted to the bar in 1819, became a judge in State and Federal courts; served several terms in the Virginia assembly; and from 1831 to 1837 was a member of Congress Then till 1844 he was judge of the United States court for the district of Virginia, and in that year became Secretary of the Navy in the Cabinet of President Tyler Although he served temporarily as Attorney-General under Polk, he re-entered the Navy Department President Pierce, in 1853, appointed him Minister to France, and until his death he continued to fill this diplomatic position. With James Buchanan and Pierce Soulé (qqv) he signed the Ostend Manifesto (qv.).

MASON, Sir Josiah, English pen manufacturer. b. Kidderminster, 23 Feb 1795; d 16 June 1881. He was the son of a carpet-weaver and at an early age began to earn his livelihood by hawking cakes and fruits in the streets. At Kidderminster he successively tried his hand at shoemaking, baking, carpentering, smithing, painting and weaving. In the midst of his avocations he taught himself to read and write. He removed to Birmingham in 1814 where he became a toymaker. He set up a shop of his own in 1824, turning out split key rings by machinery invented by himself; prospering in this venture he added the manufacture of steel pens in 1829. In the latter branch of industry he became the largest producer in England. In 1874 he transferred his interest to a limited liability company. Mason was also interested in electro-plating, copper smelting and india rubber ring manufacture with George R. Elkington. In 1860 he established a great orphanaye at Erdington, upon which he expended \$1,500,000. He was knighted in 1872. Mason College, now part of the University of Birmingham, was founded by him with an endowment of \$1,000,000. Consult Bunce, J. T., 'Sir Josiah Mason: A Biography' (London 1882).

MASON, Lowell, American musician: b. Medfield, Norfolk County, Mass., 8 Jan. 1792; d. Orange, N. J., 11 Aug. 1872 His general education was small; in music he was self-instructed and wonderfully adept even when a boy, being choir leader in Medfield when 16, and a teacher in Savannah, where he removed in 1812. He came to Boston in 1827, was president of the Handel and Haydn Society there, and in

1832 founded the Boston Academy of Music. He visited Germany in 1837 in order to acquaint himself with improved methods in teaching music. In 1821 he published a collection of psalm tunes based on Gardiner's 'Sacred Melodies,' but including some of Mason's own compositions. He is best known for his hymn tunes, notably Cowper "There is a Fountain," and missionary hymn "From Greenland's Ic3 Mountains" Mason's more important publications were 'Juvenile Psalmist' (1829); 'Lyra Sacra' (1837); 'The Psaltery' (1845), 'Carmina Sacra' (1841; new series 1852); 'Musical Letters from Abroad' (1853); 'Sabbath Hymn and Tune Book' (1859) Mason's musical library is now the property of Yale University.

MASON, Otis Tufton, American ethnologist: b. Eastport, Me, 10 Aprıl 1838, d Washington, D C, 5 Nov. 1908. He was graduated from Columbia University in 1861 and from 1861-84 was at the head of its preparatory school. From 1884-1908 he was curator of ethnology at the United States National Museum. He was a member of various scientific societies and published 'Cradles of the American Aborigines' (1889); 'Woman's Share in Primitive Culture' (1894); 'The Origin of Inventions' (1895); 'Indian Basketry' (2 vols, 1904) He was coeditor of the 'Standard Dictionary' and edited the anthropological department of the American Naturalist

MASON, Rufus Ogden, American physician: b Sullivan, N. H, 22 Jan 1830; d. New York, 1903. He was graduated from Dartmouth College in 1854 and from the College of Physicians and Surgeons in New York in 1859. During the Civil War he was an acting assistant surgeon. He was almost as well known as an author as he was a physician and among his books are 'Sketches and Impressions, Musical, Theatrical and Social, Including a Sketch of the Philharmonic Society of New York' (1887); 'Telepathy and the Subliminal Self' (1897); 'Hypnotism and Suggestion in Theiapeutics' (1901).

MASON, Stevens Thomson, American politician: b Leesburg, Va, 27 Oct. 1811; d New York City, 4 Jan. 1843 He was the son of Gen. John T. Mason of the noted Mason family of that State He received his education at Transylvania University, Lexington, Ky, to which place his father had removed in 1814 On 12 July 1831, when not 20 years of age, he was appointed secretary and acting governor of the Territory of Michigan, a position he continued to occupy until 8 Sept. 1835. The death of George B. Porter, the territorial governor during his term, left Mason for several years the actual governor Although vigorously opposed by the people of the Territory at the time of his appointment on account of his minority, his stand in the controversy with Ohio, known as the Toledo War, brought him such popularity that he was unanimously chosen governor by the people upon the adoption of the constitution by the State on 2 Nov 1835, a position to which he was re-elected in November 1837. In 1840 he removed to New York City to take up the practice of law On 4 June 1905, under the authority of the Michigan legislature, his remains were transported from New York

and reinterred in Capitol Park, Detroit, the site of the first capitol of the State

He is known in the history of Michigan as the "Boy Governor," as he was the youngest person ever appointed to so important an executive position in the history of the nation.

MASON, William, English poet b Hull, 12 Feb 1724, d. York, 7 April 1797 He was educated at Cambridge and his first publication was 'Isis,' a poem, satirizing the Jacobitism and High Church principles which pievailed in the University of Oxford In 1752 he published 'Elfrida,' a tragedy, with choral odes, on the ancient Greek model Having taken orders in the Church he obtained the living of Aston, in Yorkshire, and was appointed one of the royal chaplains In 1759 appeared 'Caractacus,' a drama Some years after Mason was made precentor and residentiary canon at York. One of his principal works, the 'English Garden,' a poem, appeared between 1772 and 1782, and was translated into French and German In 1775 he published the poems of his friend Thomas Gray (qv) with memoirs of his life. His principal subsequent publications are 'Odes', 'Life of William Whitchead,' with his poems (1788); 'Essay on Church Music' (1795). There is a tablet to his memory in the Poets' Corner, Westminster Abbey. In 1811 a complete edition of his works appeared.

MASON, William, American musician: b Boston, 24 Jan. 1829, d New York, 14 July 1908 He studied music in Germany under Moscheles, Hauptmann, Moritz, Dreyschock and Liszt; made tours as a pianist in Europe and the United States. In the year 1855, with Theodore Thomas and others, he established the Mason and Thomas recitals of chamber music, which were continued until 1868. His compositions, many in number, are mainly for the piano. He published 'Two Pianoforte Methods' (with E S. Hoadley); 'Pianoforte Technics' (with W. S. B Matthews); 'System for Beginners' (1871); 'Touch and Technics' (1878); 'Primer of Music' (1894); 'Memories of a Musical Life' (1901), etc.

MASON, Mich., city and Ingham County seat, alt 886 feet; on the Michigan Central Railroad, 12m SE. of Lansing. It is situated in a farming area. The manufactures of Mason include medicines, pickles and sauerkraut, prepared cereal foods, and truck bodies. The city has a public library, and a historical museum is maintained in the courthouse Near by is a state game farm. Mason was named for Stevens Thomson Mason (q.v.), first governor of Michigan It was first settled in 1837; was incorporated as a village in 1840, and became a city in 1868. The year of its founding was that of Governor Mason's election to a second term. The city's government is administered by mayor and council. The water supply system is under municipal ownership. Pop. (1930), 2,575; (1940) 2,867.

MASON-BEES, a name given to the small wild bees of the genera Osmia, Ceratosmia and Chalcidoma, which construct their nests with sand or gravel, agglutinated together by means of a viscid saliva, and fix them on the side of walls, under stones, within the hollows of plant stems whence the pith has been removed, or avail themselves of some other cavity for that purpose. The mason-bees, like the carpenter-

bees, leaf-cutters and other allied forms of the family Megachuldæ, are solitary in habits, not living in communities, although groups of cells are usually found near together, made by the same mother-bee, and each containing a single egg and food—a mixture of honey and pollen Consult Howard, L O, 'The Insect Book' (latest ed, New York 1914), which contains an extensive bibliography of the subject; id, 'Standard Natural History' (Vol. II, Boston 1884), Fabre, Henri, 'Insect Life' (English trans, London 1901); id, 'Mason Bees' (New York 1914).

MASON CITY, Iowa, city and Cerro Gordo County seat; alt 1,130 feet; on Lime Creek; 121m. NE. of Des Moines, 37m SE of Albert Lea, Minn; on the Milwaukee; Chicago and North Western, Minneapolis and St Louis; Rock Island, and Chicago Great Western railroads, has an airport with airline service Mason City is in a grain, dairy and livestock region Beet fields, in the surrounding area, are cultivated by hand, to a great extent by Mexican laborers. There are clay, shale and limestone deposits nearby. The chief industrial products are Portland cement, brick and tife, processed meat and beet sugar. Nine miles west is Clear Lake State Park with a lake seven miles long and three miles wide. The \$300,000 public library is located in a seven-acre wooded tract Mason City Junior College (1918) was the first such school in the state. Wagner-Mozart Music Hall is a school building devoted to high school musical organizations. The first settlement here was by Freemasons in 1853 Mason City became a town in 1870, a city in 1881, and received its present charter in 1916. It is governed by a city manager. Pop. (1930) 23,304; (1940) 27,080

MASON AND DIXON LINE, in American history, the boundary line in lat. 39° 43′ 26 3″ north, between Maryland and Pennsylvania, surveyed by Charles Mason and Jeremiah Dixon between 1763 and 1767 in settlement of the dispute between the Baltimore and Penn families, respectively, the proprietors of Maryland and Pennsylvania. Before the Civil Warthe line came to designate the boundary or division line between the free and the slave states east of the Ohio Popularly, it has come to mean the dividing line between the North and the South. See also Boundaries of the United States.

MASONIC FRATERNITY, The, or FREEMASONS OF ANCIENT FREE AND ACCEPTED MASONS, generally conceded primacy among fraternal orders, is disseminated over the civilized world. It has no central authority, being divided into more than one hundred grand jurisdictions each autonomous, in addition to which, there are several large and widespread concordant orders or so-called "higher degrees." The main stem, variously referred to as "Ancient Craft Masonry," "Ancient York Masonry," "Symbolic Masonry," or the "Blue Lodge" consisting of three degrees, the Entered Apprentice, Fellow Craft and Master Mason (and, historically, the essentials of the Royal Arch, though the latter is not now generally considered included), is probably directly descended from the fraternity and lodges of operative stonemasons and cathedral builders of the Middle

Ages, which gradually at first, but, definitely and permanently in the early 18th century AD, became exclusively speculative in character. Freemasonry is cosmopolitan and democratic, bearing upon its rolls the names of the nobility, statesmen, scholars, and others of high rank but a much larger number of the middle class It admits men of every nationality, religion, creed and political persuasion, the qualifications for membership being few, such as belief in God as the Great Architect of the Universe, good moral character, a fair degree of intelligence, and absence of maim or defect in body which would prevent the candidate from performing his duties as a Mason. By long-continued custom, the society refrains from solicitation of candidates, all who enter must do so unbidden and of their own free will and accord. The essential teachings of the craft are few and simple, illustrated by the symbolism of the working tools such as the plumb, square, level, compasses and other symbols, though many embellishments and refinements have been adopted in the so-called higher degrees and are often embraced in Masome literature, so that, to some, the doctrine has become highly spiritual, though the fraternity rejects all suggestion that it is a religion or rivals

any religious sect Antiquity.—During the 18th and first half of the 19th century, Masonic writers laid great stress upon the possible origin of the society in the remote ages of the past. Absolutely without any historical basis of record as were most of these theories, yet men of learning loaned their influence to perpetuate the fables extant concerning the fraternity. Some asserted (1) that the history of the race was the story of Masonry, beginning with the migration from the Garden of Eden; others (2) that it sprang from the Patriarchal period; and still others contended (3) that the society was the successor of the ancient mysteries of the Orient; (4) that the Temple of Solomon was its cradle; (5) that the Crusaders and the Knights Templar carried it forward from their times; (6) that the Roman colleges of artificers and builders of the Middle Ages handed down the craft to posterity, (7) that the civil strifes in Great Britain of the 15th and 16th centuries, and subsequent political events, made the institution possible; (8) and a later class of writers placed the origin to the credit of the Rev. James Anderson, D.D. and the Rev. John Theophilus Desaguliers, L.L.D., FRS. and their compeers of «The Revival of 1717 AD » Several of these authors changed their views later in life; and, during the past 50 years, the intelligent Masons of Great Britain and the United States have attempted to build up from the broken fragments of the pastcontained in fugitive lodge records and old constitutions extending back more than three centuries—a reasonable history of the «operative» Masonry of the British Isles and the continent of Europe, as well as that of the present «speculative craft.» In this effort, assistance has been rendered by scholars not connected with the fra-The critical reader will note in the enumeration above that many plausible theories might be founded, both on history and legend, but the strongest factor in the appeal to antiquity, nevertheless, is the «Legend of the Third Degree.» In one form or another, the allegory of the fall of man, the sacrificial redemption of the race, the doctrines of the resurrection and immortal life, permeated the peoples of every age and became the motive of many migrations When, therefore, a society arose which claimed to solve some of these mysteries—nay, even to have descended from those periods—it is not singular that the order should have attracted disciples; especially when shielded from public gaze by a veil of secrecy, the universality of the printed page not having yet been established

Origin in Great Britain.—The majority of modern opinion holds that Freemasonry of the present day, that is to say, that of the symbolic or «blue lodges,» had its origin in the British Isles, probably in medieval times and, therefore, peculiar interest centers in the history, legends, and constitutions of the fraternity in that quarter. The heyday of the operative cathedral builders rapidly waned after the Lutheran reformation of 1517 by reason of the decline in the construction of church edifices, so that our first glimpse into lodges in Scotland follows by some three quarters of a century the culmination of operative prosperity, though the Old Constitutions of the English Freemasons carry our knowledge back some two centuries further. The earliest lodge minutes in Scotland are those of the Lodge of Edinburgh for July 1599, and those of the following year show that the lodge had already begun to admit «accepted» Masons, that is, gentlemen or theoretic Masons, not of the stonemasons' trade or of any trade but of the gentry and nobility. Other lodge records show the presence of this class in Scotland variously between 1652 and 1696 The earliest English lodge records we know of are those of Alnwich Lodge of 1701 and York Lodge for 1705, though the existence of other lodges is attested by extraneous evidence, for example, the diary of Elias Ashmole, a prominent scholar and antiquary of that day, who records that he was made a Mason at Warrington in Lancashire in 1646, and Dr. Plot's statement in 1686 that the society was spread more or less over the nation. Fortunately, there have been preserved a most informative group of old parchments, some in book form and some in rolls, containing the fundamentals of the English craft, that is, the legends and charges These are the «old charges» or «Gothic Constitutions, the oldest of which, the Regius or Halliwell MS, lay in the British Museum for many years cataloged as «A Poem on Moral Duties.» It is undated but antiquaries ascribe it to about the year 1390 The next oldest, also in the Brit-ish Museum, is the Matthew Cooke MS of early 15th century production. About eighty similar MSS. are preserved, some dated, others evidencing origins through the 16th and 17th centuries. They have been classified into families, each family including those either copied one from the other or evidencing close relationship. Though variations exist amongst families, and to a lesser extent amongst those of the same family, the framework and substance of all are the same, the differences being much as though the contents had been committed to memory and transmitted orally, so that, when occasionally reduced to writing, faulty memories produced divergent results. Each consists of three main parts: (1) the invocation, (2) the legends, and (3) the

The invocation or declaration of faith is usually of Christian character, the following being an example contained in a version of 1583

in possession of the United Grand Lodge of

England

England
The mighte of the Father of Heaven and yo wysdome
of ye glorious Soone through yo grace & yo goodnes of
yo holly ghoste, yo bee three psons & one God, be wh,
yo at or beginning and give vs grace so to govine vs
herein or lyving that wee maye come to his blisse that
nevr shall have ending. AMEN.

The legendary portion purports to account for the origin of Geometry or Masonry, (those terms being used synonymously), before the Flood and the preservation of the science by its having been written on two pillars, one of which would not burn in fire and the other of which would not drown in water. It was then carried into Egypt where Euclid espoused and taught it to the Egyptians. Pythagoras is said to have made much use of it. The building of King Solomon's Temple and the part played by Masons and Masonry is recorded; (whence the Temple legend and allegory in modern rituals). The science is next said to have been carried into France where it came under the protection of Charles Martel, and thence it was carried into England in the time of St. Alban. apocryphal history then recites that the Masons received the patronage of Prince Edwin and King Athelstan, the latter of whom called a national assembly of the craft at York where he gave them charges (a charter) authorizing yearly assemblies.

The charges vary in number, sometimes 15 for the Masters and a like number for the workmen, in other MS, 25 for all without discrimination, and various other numbers and arrangements. These charges enjoin adherence to the church, honor and morality, discharge of just obligations, the performance of honest work for fair wages, loyalty to the King and abstinence from plots and conspiracies, secrecy of counsel within and without the lodge, mutual respect, aid and assistance amongst the craftsmen, seven years apprenticeship, certain standards of character and bodily integrity as prerequisites for apprenticeship, abstinence from gaming or lewd company, attendance upon the annual assembly, and other provisions of like kind, all with some variety of language and arrangement amongst the various MSS. Most of the known copies are of English origin and, while they do not afford the same insight into the lodges as do the minutes of lodges in the North, the oldest are approximately two centuries anterior and are generally accepted as the formulae used in the ceremonies of admitting apprentices to the lodge. They also form the basis, as closely as speculative uses permit, of the present day rituals, customs and laws of the society.

The credit for the conception of the Gothic structures which abound throughout the British Isles and Western Europe, and which were erected in the 400 years between the 11th and 16th centuries, as well as the identity of the architects thereof, has never been settled. Even the application of the name Gothic to this style of architecture is unaccounted for, every nation of that name having disappeared several centuries before the first example was erected. Old records, more recently discovered, and examined in the light of present-day research, have led Masonic writers to revise their formerly accepted assertion that the cathedrals and other public edifices of the Middle Ages were planned by church dignitaries. The opinion now obtains that the Master Masons of that period were the archi-

tects. Performing the work under the guidance of the Master and closely guarding the mystery of the craft were the Fellows and Apprentices. Each workman placed his mark upon the stone fashioned by him so that it could be identified and his wages paid accordingly. Innumerable examples of these marks are found in structures of the period. The early records indicate that the living quarters or tiled lodges were used as places of instruction and communication of the mystery of the craft, strict secrecy being enjoined to preserve the monopoly and particularly to prevent encroachment by «cowans,» that is, masons of meaner accomplishments such as brick and rough masons and possibly even including some of more eminent ability who did not conform to the charges or, as it was expressed in Scotland, who lacked the «Mason Word.» The status of the «accepted» or gentlemen Masons during the years of operative pre-eminence is not clear, but it is certain that the practice of admitting them was by no means exceptional during the 16th and 17th centuries and that, by the beginning of the 18th century, the lodges contained a considerable theoretic element which, in some instances, predominated. It has been shown that, of those named by Elias Ashmole as present in the lodge at Warrington in 1646, not one was a working stonemason. To this peculiar custom is unquestionably due the preservation of the society during the period of transition from operative to speculative Masonry, a period of more than a century, during which English lodges diminished in number (we positively know of only six or seven with intimations of four or five more in the early years of the 18th century), and during which the lodges in Scotland, though keeping up their existence, had been reduced in importance and activity. It was these «accepted» or theoretic Masons who conceived and carried through the speculative reorganization of the so-ciety in 1717. The term «speculative» is not confined to those who founded the Grand Lodge of England or their successors, for they were of the same kind and in some instances the same individuals who were «accepted» prior to that event. We do not know, however, to what extent they had theretofore indulged in the study of symbolism or moral science. While lodges of the ancient period were chiefly operative, there were even then speculative members. According to the old Masonic MSS., Prince Edwin was cof the Speculative part, a Master, and the Regius MS. of about 1390 mentions lords, dukes, earls, barons, knights and squires, as members. Probably due to decline in cathedral building, the operative element diminished and the speculative feature grew until, at the Revival of 1717, the latter was greatly in the ascendant. Prior to and even for a time following that event, there seems to have been some rivalry between the two elements, but the trend of events favored the speculatives and they soon became entirely predominant, the operative membership gradually disappearing. We do not know to what extent signs, tokens, words, and other modes of recognition were used prior to 1717, but some of the old MSS indicate that they had a place. Also, the «benefit of the Mason Word» appears in the Scots records, and the Melrose MS. of 1581 (known to posterity by the transcript of 1674) refers to «ye privilege of ye compass, square and level, and ye plum-rule.» Extraneous documents refer to secret modes of recognition, and Dr. Plot, writing in 1686, mentions their existence quite positively. Despite lack of evidence, persistent efforts, entirely fanciful, have been made repeatedly to identify Freemasonry in some more or less close association with the Rosicrucians, the Alchemists, and the Hermetic philosophers. It can only be said that many secret societies have, from time to time, sprung up, some imitating and some pretending to rival the Masonic institution, but if there is a character of the order stronger than any other, it is its consistent aloofness from association with, or recognition of, any other order or organization, and its persistent repugnance to

innovations. The Grand Lodge Era.—In 1716, as we are informed by Dr. James Anderson, the «historian of the Grand Lodge,» the members of four old London lodges, together with some old brethren, met and, having put into the chair the oldest Master Mason, they constituted themselves a Grand Lodge pro tempore, forthwith, revived the quarterly communication of officers of lodges, and resolved to hold the annual assembly and feast, and then to choose a Grand Master Accordingly, on St. John Baptist's Day, 24 June 1717, at the assembly and feast, Anthony Sayer, gentleman, was installed Grand Master. In 1721 the Duke of Montague, Grand Master, instructed Dr. Anderson, with a committee of 14, to collect all the old documents of the craft and digest them in a new and better method. This work, consisting of an elaboration of the old legends, the revised «Charges of a Free Mason» and a code of General Regulations, which had been adopted in 1722, was completed, approved, and published in 1723 and is usually known as «Anderson's Constitutions of 1723.» This movement, though called the «Revival of 1717,» because it was the asserted rejector than the large down. was the asserted reinstatement of the legendary General Assembly mentioned in the Gothic Constitutions, was something more; it was also a reorganization. The Grand Lodge assumed jurisdiction over existing lodges in and about London and Westminster which accepted the new regime, and forbade the formation of new lodges by its adherents without its consent, stated annual and quarterly communications were scheduled; the lodges abandoned all efforts to regulate the building trade and devoted themselves to speculative moral science; degrees, rituals and lectures, theretofore rudimentary, were formulated or perfected; the old charges were revised and unified; elaborate regulations were adopted, and lastly, the exhortation in the Ancient Constitutions «to love God and Holy Church» was modified by obligating the Mason only «to that religion in which all men agree, leaving their particular opinions to themselves, that is to be good men and true, men of honor and honesty.» Two clergymen, Dr. James Anderson (b. Edinburgh, 5 Aug. 1684) and Dr. John Theophilus Desaguliers FRS. (b. France, 12 March 1683), the third Grand Master, together with George Payne Esq, who occupied the position for the second and fourth years of the organization are supposed to fourth years of the organization, are supposed to have been the most influential in the movement, though none of them are known to have instigated the step. Dr Anderson, 15 years later, published his «Constitutions of 1738.» From the time of its creation, the premier Grand Lodge flourished, many new lodges were formed, its scope of jurisdiction gradually expanded, and applicants in increasing numbers knocked at the

doors of the lodges. There was not absent. however, a considerable dissenting element adhering to the old customs and distrusting the new order and also several rival and disparaging orders which enjoyed but short existences under the names of Antediluvian Masons, Honorary Masons, Apollonian Masons, Real Masons, Modern Masons, Philo-Musicae et Architecturae Societas Apolloni, Scald Miserable Masons, the Ancient Noble Order of the Gormogons, the Order of Gregorians and the Noble Order of Bucks. York Masonry, by reason of the legendary first General Assembly, called there by King Athelstan, enjoyed some pre-eminence in reputation, which was possibly the inducement for York Lodge, in 1725, to meet not only as a private lodge but also as a "General Lodge" It chose a Grand Master and called itself the "Grand Lodge of All England.» This ambitious enterprise was tolerated by the premier Grand Lodge but became dormant after about 20 years. Revived in 1761, it lived for about 30 years more during which, in 1779, it constituted a disaffected branch of Lodge of Antiquity the "Grand Lodge of England South of the River Trent," which survived only until 1790. In 1770, a "Supreme Grand Lodge" was formed, it is thought by Scots Masons, but expired about 1775. By far the most important of the dissident bodies arose are most important of the dissident bodies arose in 1752 in the «Grand Lodge of England According to the Old Institutions," commonly called the «Ancient» Grand Lodge, or «Athol» Grand Lodge, because of the long Grand Masterships of the two Dukes of Athol, father and son This movement, for many years, ranked as the «Great Masonic Schism,» but more recent investigations have shown that it was instituted by Irish Masons residing in London, few of its members, if any, having belonged to the older branch, upon which the name «Moderns» became firmly attached The Ancients steadfastly asserted, mainly through their energetic and contentious Grand Secretary, Laurence Dermott, throughout the 60 years of their separate existence, that the Moderns had departed from the «Landmarks» of the Craft and, therefore, that the former was the true and ancient rite. The changes alluded to, though of minor character, were sufficient to put the premier Grand Lodge on the defensive, and the Ancients, conferring in their lodges the Royal Arch Degree, a very popular working, were through the latter part of the 18th century rapidly overtaking the older rival in both Great Britain and America, and actually seemed to be preferred by the Grand Lodges of Ireland and Scotland. Traces of this divergence are still found in America and elsewhere, some Grand Lodges bearing the name Free and Accepted Masons while about an equal number, Ancient Free and Accepted Masons, although these names do not always indicate the line of descent, being sometimes chosen as a matter of taste. At all times painful to the leaders of each of the two branches, the estrangement was brought to a happy ending on St John's Day, 27 Dec. 1813 by their most harmonious merger into the «United Grand Lodge of Ancient Freemasons of England,» the governing body of English Free-masonry at the present day. It was, thereupon, declared «that pure Ancient Masonry consists of three degrees and no more, viz., those of the Entered Apprentice, the Fellow Craft, and the Master Mason, including the Supreme Order of the Holy Royal Arch.» The inclusion of the last

named was a victory for the Ancients, because the Moderns, though conferring the degree in a «Chapter,» did not recognize it as pait of the craft degrees In time, however, the Royal Arch was separated from the Grand Lodge and administered under the jurisdiction of the chapter, though its three principal officers are identical

with those of the Grand Lodge.

In Scotland.—The honor of seniority amongst lodges has been the subject of much dispute in Scotland, the determination by the Grand Lodge first giving Lodge of Edinburgh the rank of No. 1. Later, «Mother» Kilwinning Lodge was preferred but, in order not to disturb the numbering of other lodges, the rank of No. 0 was accorded it. Meanwhile, other old lodges had also been designated as No 1, and for like reasons suffixes were added so that we have Lodge of Melrose St. John No. 1 (bis) and Lodge of Aberdeen No. 1 (ter). The oldest minutes now extant of these four lodges are dated: Edinburgh 1599, Kilwinning 1642, Aberdeen 1670, and Melrose 1674, but extraneous records show all of them to be much older, some possibly reaching back to the 12th century. Other old lodges are: Scoon and Perth No. 3; Glasgow St. John No 3 (bis); Atcheson-Haven (extinct in 1866); and Ancient Lodge No. 49 of Dundee, all anticdating 1650. The lodges in Scotland were all operative in character, but numerous records through the 17th century testify to the admittance of nonoperative members. On St. Andrew's Day, 30 Nov. 1736, the example set in England and Ireland was followed by the formation of the Grand Lodge of Scotland, though several lodges maintained their independent existence long after that date. Lodge of Glasgow St. John No 3 (bis) not only declined to join the Grand Lodge for many years, but refused to admit nonoperative Masons until 1842 The first Grand Master, Baron William St Clair of Roslin (Earl of Orkney and Caithness), was followed by the Earl of Cromarty. Scotland's «Masonic gem» is the «Prentice's Pillar» in the chancel of Roslin Chapel, Edinburgh

In Ireland.—Traces of the craft in Ireland are few and obscure prior to 1726, though extraneous references demonstrate that it was well known as early as 1688. The earliest minutes are those of 8 Dec. 1726, in a book recording the proceedings both of a private lodge at Cork and of a Grand Lodge in the Province of Munster. The London Journal, 17 July 1725, mentions an Irish Grand Lodge and, in that year, Anderson's Constitutions were advertised for sale by Dublin bookstores. The Grand Lodge of Ireland was formed at Dublin apparently 3 Feb. 1728, though its earliest minutes were destroyed under circumstances never satisfactorily explained. Lord Kingston, who had been Grand Master of England in 1729, was made Grand Master of the Irish Grand Lodge in 1730, and again in 1735 and 1745. From 1747, Irish Masonry prospered more than formerly. A curious tale, accepted by some, doubted by others, has it that The Hon. Elizabeth St. Leger, then a girl of 20 years, who afterwards married Richard Aldworth, having been discovered spying upon a Masonic lodge, was initiated in order to assure her retention of the secrets. The tale arose some years after the supposed event the scene is laid in years after the supposed event, the scene is laid in various lodges, and the character of an initiation is not specified, but a portrait of the lady, clothed as a Freemason, hangs in many Irish lodgerooms,

and her apron is preserved, thus assuring her standing in the opinion of some as the conly female Freemason»

On the Continent.—Attempts to connect the building crafts of Continental Europe with speculative or symbolic Freemasonry have signally failed Both the German Steinmetzen (stonemeasurers) and the French Masons produced works comparable to the Freemasons of Britain and maintained societies not unlike those in the Isles. Strangely enough, our first documentary introduction to the Steinmetzen (Constitutions of 1459 and Torgau Ordinances of 1462) closely approximates the dates of the earlier Gothic Constitutions and, more interesting yet, is the fact that the two are in substance quite similar, some precepts being in practically iden-tical terms. Less is known of the French craft (Les Compagnons du Tour de France) virtually all of our information coming from the book published in 1841 by Agricol Perdiguier. It is possible that the disintegration of the German and French operative craft was followed by short-lived nonoperative societies but they did not develop into Masonic lodges, nor did York Rite Masonry, upon its introduction into the Continental countries (France about 1726 and Germany somewhat later) encounter any societies which were recognized as even remotely related to it. Freemasonry, as adopted into Germany, soon became divided into at least three Grand Lodges, one of them adopting Christianity as its doctrine, and all of them to some extent permeated by sectarian discord Less peaceful yet was the career in France, where the Grand Orient, to the disheartenment of British and American Grand Lodges, subjected itself to criticism on five points: (1) its organization and degrees which included four above the three craft degrees; (2) a connection with Co-Masonry (female); (3) political disputes; (4) religious differences; and (5) invasion of other jurisdiction by chartering lodges therein. Up to 1849, the Grand Orient had made no declaration respecting a belief in Deity as a condition for membership, but followed Anderson's Constitutions of 1723, which were either negative or indefinite upon the subject. Yet, the Grand Orient was recognized as regular by all other Grand Lodges On 10 Aug 1849, that body declared that "Freemasonry has for its principles." the existence of Deity and the immortality of the soul," which remained in effect until 14 Sept. 1877 when the declaration was changed to read: «Masonry has for its principles mutual tolerance, respect for others and for it-self, and absolute liberty of conscience.» Most British and American Grand Lodges, soon thereafter, severed fraternal relations with French Masonry, not, however, as sometimes stated, solely because of this action but rather because it was the culmination of a long series of irthe Second World War, there was much senting the Second World War, there was much sentinent, particularly in England, for the restoration of concord with the Grand Orient. In Scandinavian countries, Freemasonry has taken on peculiar characters, though generally recognized as a regular of these lands are than nized as regular. Kings of these lands are the hereditary Grand Masters, the doctrine is Christian, and the rite is a peculiar combination of portions of the York and Scottish degrees.

In Russia, Freemasonry first appeared toward the end of the 18th century, the body of its membership being composed of the aristocracy. Its influence is vividly set forth in Tolstoy's War and Peace dealing with the War of 1812 (Napoleon's invasion of Russia) During the reign of Czar Nicholas I (1825-55), Masonry was put under the ban because of religious and political difficulties, particularly the mutiny of the officers of the Guard, known as the Decembrists, in 1825, in which many prominent Masons participated. Thereafter, Masonry existed as an underground order until the 1860's. There has been no evidence of the order in Russia subsequently, though several times it has been suspected to exist

In other European nations-Spain, Portugal, Italy, Greece, Austria, Poland, Czechoslovakia, and the Balkans-Freemasonry has often enjoyed periods of peace and prosperity and has attracted men of superior attainments only to have its career checked or interrupted by religious or political persecution, which, after all, is not unnatural in view of the wide gulf between Masonic liberality of belief and conscience and the diametrically opposed religious and political institutions established amongst those peoples long antecedent to the importation of Free-

masonry.

In America.-Jonathan Belcher, governor of Massachusetts, was made a Mason on a visit to England in 1704 and is the first Freemason known to have been in the Western Hemisphere. Some of the first lodges in the colonies were held under the immemorial right of Freemasons under the Old Constitutions to meet in lodges anywhere that five or six brethren could be assembled, just as the similar right was acted upon sembled, just as the similar right was acted upon in England by the Old or St John Masons for some years after the formation of the Grand Lodge in 1717 Such a lodge seems to have been held at Fredericksburg, Va., as late as 22 Dec. 1753, conferring on that date both the Entered Apprentice and the Royal Arch Degrees. Entered Apprentice and the Royal Arch Degrees. The primacy of lodges in the United States is disputed between Boston and Philadelphia, the contest revolving around questions not only of priority between duly chartered lodges but even as to the holding of lodges without charters under immemorial right. Boston claims an immemorial right lodge, without clear proof, as early as 1720, but it is well settled that such a lodge, perhaps several existed at Philadelphia as lodge, perhaps several, existed at Philadelphia as early as 1730, for Benjamin Franklin was made a Mason there in February 1730. On 5 June 1730, Daniel Coxe of Burlington, N. J., was appointed by the Duke of Norfolk, Grand Master of the premier Grand Lodge of England, Provincial Grand Master for Naw York, New Joseph cial Grand Master for New York, New Jersey, and Pennsylvania. On 13 or 30 April 1733, Lord Montague, Grand Master of the Grand Lodge of England, issued a like deputation to Henry Price of Boston covering New England. There is no evidence that Coxe acted under his depua Provincial Grand Lodge in Boston 30 July 1733, and the same day constituted the First Lodge of Boston which, some years afterwards, consolidated with two others and is now St. John's Lodge. The Pennsylvania Masons under the Grand Mastership of Benjamin Franklin petitioned Price, whose jurisdiction was reputed to have been extended over all of North America, for a charter for a Grand Lodge which was reported, probably incorrectly, as granted 21 Feb. 1735. The supposed superiority of

chartered lodges as against the informal lodges held under the Old Constitutions or immemorial right seems to depend upon the regulations of the Grand Lodge of England approved 24 June 1721 forbidding the formation of a lodge without the Grand Master's warrant, but regard must be given to the fact that those regulations and, indeed, all the pretended jurisdiction of the Grand Lodge of England were expressly limited to lodges in London and Westminster together with such others as voluntarily joined the Grand Lodge Several lodges in England and Scotland maintained their independent existence for some years after the formation of the Grand Lodges in the respective kingdoms. Hence, an immemorial right lodge in America may have been as legitimate as a warranted lodge, and the respective claims of the Massachusetts and Pennsylvania brethren may be considered by others a mixed question of law and fact still undetermined. Charters for other lodges in the Americas, issued by both the Moderns and the Ancients were especially prolific after the middle of the 18th century. To these must be added of the 18th century. To these must be added charters issued by the Grand Lodges of Ireland and Scotland, both of which were active in the spread of Freemasonry, not a little augmented by army or regimental lodges in practically all of the armed forces of the period. Among the many prominent men who belonged to the fraternity in the formative period of the nation, besides Franklin, were Washington who was made a Mason in the lodge at Fredericksburg, Va, and became Master of the lodge at Alexandrian Master andria, Va; Monroe, Fulton, Montgomery, Burr, Pame, Hamilton, Sherman, Rush, Whipple, Gerry, Stark, Livingston, Warren, John Paul Jones, Witherspoon, Revere, Hancock, Lafayette, Steuben, De Kally, and later Ledeson, Political Company, 1988, 1988, 2018, Steuben, De Kalb; and later, Jackson, Polk, Fillmore, Buchanan, Johnson, Garfield, McKinley, Taft, Harding, Theodore Roosevelt, Franklin D Roosevelt and Harry S. Truman were

lin D Roosevelt and Harry S. Truman were identified with the craft.

In Other Countries.—Freemasonry, at various times, has spread into practically all civilized nations, Grand Lodges now existing in the provinces of Alberta, British Columbia, Ontario, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Quebec, and Saskatchewan, in Canada; New Zealand, New South Wales, Victoria, South and West Australia, Tasmania, Queensland, the Philippines, Mexico, Puerto Rico, Cuba, and Central and South America. On the Continent of Europe during the Second World War, Freemasonry was suppressed or became virtually extinct, except in Sweden, Switzerland and possibly Portugal.

Statistics.—The United States stands preeminent in its patronage of the society, having 49 Grand Lodges with something over 15,500

49 Grand Lodges with something over 15,500 subordinate lodges and approximately 2,500,000 members. In the rest of the world, there are some 60 Grand Lodges with about 11,000 subordinate lodges and 1,000,000 members. ordinate lodges and 1,000,000 members, not including a score or more of Grand Lodges which, with their subordinate lodges, have been suppressed or extinguished on the Continent of Europe, in the Philippine Islands, and in China. These figures do not include the so-called higher degrees of the York Rite or the Scottish Rite.

Supplemental Degrees and Orders.-Within two decades following the formation of the Grand Lodge of England, two classes of so-called higher degrees began to be worked:

(1) those apparently of English origin which attached themselves to York or Craft Masonry, and (2) those of Continental origin constituting the Scottish Rite, founded upon, but more or less independent of, the British craft

The first of these was the Holy Royal Arch. the essentials of which probably existed prior to 1717 Though not recognized officially by the premier Grand Lodge, it came to be conferred by the lodges as a degree designed to complete the Third Degree, being conferred only upon Masters of lodges. The author and origin of the ritual are unknown but the Chevalier Andrew Michael Ramsey has been credited with its creation. Coming into the Masonic system sometime between 1730-50 and before the Third Degree was worked in all lodges (those which conferred it being called «Master's Lodges»), the Royal Arch became very popular and the especial pride of the Ancients who considered it an indispensable part of the craft working. The Moderns, while not recognizing the degree as a part of Craft Masonry, conferred it in «Chapters» The first lodge records showing the working of the degree are those of Sterling Rock Lodge in Scotland for 30 July 1743 (their verity questioned); and in America, the minutes of a lodge at Fredericksburg, Va, in 1753. At the Union of the Ancients and Moderns in 1813, the Royal Arch was declared to be a part of pure ancient Masonry, though it was soon segregated under the administration of the Grand Chapter, the principal officers of which are the same as those of the Grand Lodge The Mark Master, Past Master and Most Excellent Master Degrees which are, in America, under the Royal Arch Chapter, are of later origin, the last named possibly the work of Thomas Smith Webb in America These several Chapter degrees are called "Capitular Masonry." The further degrees of Royal and Select Masters are known as the "Council" or "Cryptic Masonry" The Order of Knights Templar, the only avowedly Christian element in the whole galaxy of degrees, is theoretically derived from the Crusades and many attempts have been made to show an actual connection, chief among which is the theory of the «Baldwin Encampment,» based on the fancied association of the Freemasons with the Crusaders as builders of strongholds, priories, and round churches of which the famous Temple Church, London, is an example; then, the supposed flight of the surviving knights to the protection of Freemasons in Scotland, following the martyrdom of Jacques de Molai, the last Grand Master, executed 11 March 1314 But the task of supplying the 400 years of history be-tween the dispersion of the Templars and the first record of the modern order has proved impossible, so that the order must be deemed one of the additions made to the Masonic system in the latter half of the 18th century. The first mention of the Knights Templar in Masonic mention of the Knights Lemplar in Masonic records occurs in the minutes (lodge warrant) of St. Andrew's Royal Arch Chapter, Boston, Mass., 28 Aug 1769; the earliest in England in those of Phoenix Lodge No. 257, Portsmouth, 21 Oct 1778. On 8 Oct. 1779, the Earl of Eglinton, Master of Kilwinning Lodge (Scotland) warranted the "High Knights Templar of Ireland at Dublin" The records of the "Grand Lodge of All England" at York show that in 1779 the All Englands at York show that in 1779 the Royal Arch and the Order of Knight Templar were conferred as the 4th and 5th degrees, re-

spectively. That order with the Order of the Red Cross and the Order of Malta comprise «Chivalric Masonry.» Of these supplemental York Rite degrees and orders, the Council degrees, the Past Master and Most Excellent Master Degrees and the Order of the Red Cross are not conferred in Great Britain and the «Commandery» is there the "Preceptory" not using the American rituals. Also the Mark Master is there not under the administration of the Royal Arch Chapter but constitutes a separate order. Such differences have led some to use the coined term «American Rite» to describe the working in the United States but without clear specification whether only the supplemental degrees or the whole Masonic system is included. The term seems to have originated with Dr. Albert G. Mackey, known for his dogmatic declarations, some of which were erroneous or disputative, eg, his 25 «ancient, universal and immutable landmarks,» accepted by some but quite generally denied by others. The preferred authority ities recognize the three symbolic degrees of the «blue lodge» in the United States as English or York Masonry and, hence, regular and legitimate Craft Masonry The same is probably true of the Royal Arch Degree for it was so declared by the United Grand Lodge of England in 1813. The other degrees and orders of the Chapter, Council and Commandery may not be strictly so, but, by long usage, the term York has become fixed upon them The name York has become fixed upon them The name York Masonry became attached to English Freema-sonry by reason of the legendary assembly, held there under the auspices of King Athelstan, and m the same way and quite as properly as the legend of King Solomon's Temple became a part of Masonic symbolism. The term is not to be confused with «Ancient York Rite» often used to imply that the working was there practiced prior to the Grand Lodge era, for it is not known with certainty what ceremonies were employed in any English lodge in the ancient period. Unlike the craft lodges, Capitular, Cryptic, and Chivalric Masonry are organized on a national Arch Masons of the United States was instituted by a meeting of delegates at Hartford, Conn., 24 Jan 1798, and now has 49 Grand Chapters with some 3,500 chapters and approximately 500,000 members. In the rest of the world, there are about 3,000 chapters and 160,000 members. The General Grand Council of Royal and Select Masters has, in the United States under its Grand Councils, over 1,300 councils and 160,000 members. The Grand Encampment Knights Templar of the United States was organized at New York in 1816 and has some 1,600 commanderies and over 200,000 members

The Scottish Rite, the other large branch of the supplementary Masonic system, is not, so far as known, Scottish, either in origin or character, but French as to both Following the introduction of British Craft Masonry into France about 1725-26, the imaginative Latin temperament saw the possibility of elaborating upon the English rituals with the result that, by 1740, «Hauts Grades» or systems of higher degrees had begun to multiply, continuing to increase for a period of some 35 years. No complete list of them has ever been compiled but their number from first to last is said to have exceeded 200. Frederick the Great is asserted, with some disputation to have been an active with some disputation, to have been an active

Freemason and, if so, his connection was probably with the Hauts Grades, the 21st degree of which is called Naochite or Prussian Knight The progress of the system was marked by numerous dissensions and disturbances largely the outgrowth of rivalry amongst the advocates of several groupings or systems and the contention of the votaries of the lite that they were possessed of advanced secret knowledge and, thus, superior to Masons of the symbolic de-The rite eventually came to dominate the Grand Lodge of France until the revolution of 1789 virtually eliminated Freemasonry in that nation. The French Scottish Rite never revived but was reformed and reorganized in America where it was carried by Stephen Morin under a patent of 27 Aug. 1761, giving him power to form lodges in the New World Under various deputations from Morin, Lodges of Benefation were established at Albany, N. Y. of Prefection were established at Albany, N. Y, in 1767, Philadelphia, Pa, in 1781, and Charleston, S C, in 1783, followed by a Council Princes of Jerusalem at Charleston in 1788 and a Council Princes of the Royal Secret at the same place in 1797 On 31 May 1801, John Mitchell and Frederick Dalcho organized a Supreme Council 33d Degree at Charleston, which came to be 33d Degree at Charleston, which came to be recognized as the head of the Scottish Rite in the world. Through its deputy, François Auguste de Grasse Tilley, a Supreme Council 33d Degree was organized at Paris, France, in 1804, and almost at once became embroiled with the Grand Orient of France. The American bodies developed internal discord due largely to the uncontrolled creation of inspectorships and deputations and the private communications of degrees. Nonconforming groups sprang up, among which was the «Rite of Cerneau,» later merged into the Scottish Rite, Northern Jurisdiction, though offshoots of it possibly yet remain. The Charleston body, in 1813, authorized the Northern Supreme Council at New York, which subsequently removed to and is now located at Boston The Southern Council moved to Washington, D.C., where it is now seated in the House of the Temple Its title is "The Supreme Council (Mother Council of the World of the Inspectors General, Knights Commander of the House of the Temple of Solomon) of the Thirty-third and Last Degree of the Ancient and Accepted Scottish Rite of Freemasonry for the Southern Jurisdiction of the United States of America (whose See is at Charleston, in the State of South Carolina).» It is governed by a Grand Commander and not to exceed 33 deputies. There are in the United States belonging to the Supreme councils of the Northern and Southern jurisdictions some 204 consistories of the Scottish Rite with approximately 425,000 members. Supreme councils exist in England, Scotland, Ireland, Egypt, Canada, Mexico and in 13 Central and South American countries. In Europe and Theorem 2011 South American countries In Europe and Turkey, some 15 Supreme councils were suppressed during the Second World War.

In addition to the foregoing, several other orders have from time to time arisen, not Masonic, but confining their membership to Freemasons or their relatives. Among the more prominent are or have been: the «Order of the Secret Monitor» which developed out of the «Brotherhood of David and Jonathan,» the «Royal Order of Scotland,» the «Tall Cedars of Lebanon» or the «Grotto,» the «Palm and Shell,» the «Sciots» and, lastly and best known, the

«Ancient Arabic Order Nobles of the Mystic Shrine,» a social order often called the "playground of Masonry." Organizations confining their membership to Freemasons and their female relatives are: the «Order of the Eastern Star,» the «Order of the Amaranth,» the «White Shrine,» and «Daughters of the Nile." The «Order of DeMolay» is for boys and «Job's Daughters» for girls of Masonic parentage Organization and Doctrine.—Although the

three and, for a time, the four Grand Lodges of the British Isles chartered lodges all over the world, frequently in competition, the spirit of concord with which Freemasonry has, on the whole, been blessed, long since resulted in a Masonic comity by which each Grand Lodge came to recognize and respect the jurisdictions of the others Each is, therefore, independent and sovereign in its accepted zone of influence, usually, but not always, conforming to the boundaries of a state, province, nation, or other political subdivision. By reason of the intercolonial independence or even jealousy of the American colonies during the period which witnessed the introduction of lodges in America, a system of colonial and state organization, rather than national, evolved This distribution of authority has, on the one hand, promoted harmony and, on the other hand, prevented the erection of any central power competent to represent the whole fraterity or any research the whole fraterity or any research. resent the whole fraternity or any major portion of it, either as to administration, ceremonial or doctrine Freemasonry is, therefore, viewed as a whole, less an organization than it is a system of philosophy and morality administered by many organizations. The York and Scottish Rites, in some measure, reflect the political institutions under which they grew up. The former emerging from democratic surroundings, particularly those flowing from the English revolu-tion of 1688, is administered by Grand Lodges which consist of certain officers, usually Masters and Wardens and often Past Masters of the subordinate lodges. Its tenets are based on the moral principles of brotherly love, relief, truth, temperance, fortitude, prudence, justice, and fidelity. The Scottish Rite, on the other hand, arose within a monarchy and was the product of minds imbued with the theme of the approaching French Revolution of 1789, the approaching French Revolution of 1768, liberty, equality, and fraternity. Its administration is vested in self-perpetuating Supreme Councils of the 33d Degree which control the subordinate bodies, and its doctrine and literature, while not political, are, nevertheless, not oblivious to matters of church and state Though founded upon Craft Masonry, the Scotish Rite is not so much a branch thereof as it tish Rite is not so much a branch thereof as it is a separate system of Masonry; entirely so as to organization, and largely so as to doctrine. It is the predominant Masonic system in many foreign lands, particularly the Latin and Latin American countries, though it is also popular in the United States. While Craft or York Masonry is practiced in almost all countries, its greatest influence is amongst English-speaking peoples. The English rites are simple and teach elementary truths in terse phrases, the candidates participating in the working of the degrees, whereas, in the Continental rite, the presentation consists of a more numerous series of elaborate degrees embracing lessons in morality, spirituality, philosophy, allegory and classical lore, many intricate in concept and all presented on stage with

trained casts and elaborate costuming and scenery, while the candidates and members in a large group observe from the floor. Probably no other system in the world portrays, to its votaries, its teachings with such pageantry and drama. The craft lodges are relatively numerous, localized and individualistic, there being few communities of 5,000 population, and often less, in Britain or America without a «blue lodge,» whereas the Scottish Rite bodies are fewer and confined to the larger centers of population, their members residing in a large area "Morals and Dogma," the work of Albert Pike, lawyer, scholar, linguist, philosopher and moralist, which is the text book of the Scottish Rite, is worthy of any one's perusal and is unmatched by any production of other branches of the order.

Though widely disseminated and variously administered, and despite the absence of any central ruling body, Freemasonry faithfully retains its fundamental principles, teachings, legends, customs, and laws This it does as a matter of pride in, and as a token of its descent from the fraternity of cathedral builders of 500 and more years ago, and in conformity with an old precept that condemns innovations in the body of Masonry and prohibits deviations from the ancient landmarks of the craft Notwithstanding the absence of any authority capacitated to define such landmarks, and even with an abundant diversity of opinion in enumerating them, their general nature and spirit are felt and observed

It is to be remarked that, in what is commonly said to be a rapidly changing world, Freemasonry, though adhering to its old, liberal and for the most part simple creed, should not only maintain but increase its popular appeal. Though it disavows any political ideas or preferences, its fundamental tenets of freedom of conscience, and benevolence and charity toward all mankind necessarily identify it with the ideals of human lib-

erty and constitutional government.

Charities.—None of the Masonic bodies have any insurance features or offer any fixed benefits; nor will the fraternity tolerate the use of its name or symbols in connection with any insurance or business enterprise. Nevertheless, in keeping with ancient principles of mutual aid and assistance springing even from the ancient Gothic Constitutions, the lodges and Grand Lodges as well as most of the supplemental orders make large charitable contributions mostly for the aid and support of incapacitated Masons, their widows and orphans, and service boards are maintained in most large cities to care for distressed or unemployed members regardless of the lodge to which they may belong. The contributions to Masonic charities in England, though voluntary, are surprisingly large, and, there, as well as in most of the American jurisdictions, Masonic

homes and orphanages are maintained Bibliography.—The bibliography for Masonry is abundant but must be read, particularly older works, with discrimination. The following

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MASONRY AND BUILDING. Masonry, from the French, maçonnerie, meaning stone or brick work, derived from the Latin, maceria, a wall, is the operation of laying up natural or artificial stones, generally held together or made a single mass by mortar, plaster or earth. It is the most important part of stone and brick structures, and a mason frequently becomes the general contractor for a whole building of this class. The different trades required in mason building begin with building movers or the workmen who raze or demolish old buildings; then come the excavating, drainage, grading, paving, piling, foundations, rubble, cut stone, including cut moldings, modeling and stonecarving, brick masonry, concrete work, fireproofing, terra-cotta work. After this heavier construction follows lighter mason work: plastering on metal or wood lathing, and stucco. The ideal of good masonry is a struc-ture of natural or artificial stone that shall stand as the permanent skeleton of the building.

firm and enduring; its great first cost shall

mean no further care or expense

History. The Egyptian stonework that has survived the centuries is generally of enormous blocks jointed with astonishing accuracy, so as not to mar the effect of the bas-reliefs which covered several courses Assyrian walls were laid up with bricks forming the exterior surface and the interior was filled with rubble and earth. The Opus reticulatum and opus incertum were later Roman forms where small blocks of tufa or triangular brick were used for the exterior surface and the interior was filled with concrete The characteristic of Greek masonry was to use local stone, accurately cut and jointed if the stone would bear it; otherwise covered with stucco. From the lintel or beam architecture of the Greeks to the arch construction of the Romans was an advance in the possibility of size of construction, but a change from a system of making the constructive forms visible and decorative to a custom of covering rough walls with a decorative shell not expressing the sup-porting masonry work behind This method of building gave the Romans an opportunity to make their enormous structures at a low cost, because unskilled labor could be employed to much better advantage, needing only a small number of foremen Romanesque masonry was very crude and the thrusts of the arches were taken care of by a mass of abutments which were practically monolithic In Byzantine work the arches and domes were made from small blocks of stone and the thrusts were studied with much greater care. In Gothic work the arch became "alive," carrying the weights and thrusts of the upper parts of the building on slender shafts, and through flying buttresses with the utmost skill to the outer walls and buttresses. Modern work has come to partake of the character of the ancient Roman construction, that is, a veneer on interior supporting masonry of a different character. In our time, however, instead of the huge concrete monolithic buildings, an iron skeleton is used, and a thin shell often not more than four inches in thickness covers a frame work of steel beams that in a high building is little more than an iron bridge on end The old Roman flat arch construction of thin bricks or tiles held together by strong cement forming domes not over six inches thick and easily spanning 15 feet or 20 feet is also used

Men and Material.—The workmen employed on masonry are stonecutters, who generally work in stone yards away from the building, except for such trimming as may be necessary in setting the stone; stonemasons who work on the building, setting the stone; brick-layers who work on platforms continually raising and placing the brick accurately; and laborers for delivering the stone, mortar, etc., and for mixing mortar and concrete. The materials used are stone, cement blocks, brick, terra-cotta, broken stone, cinders; and adhesive materials: limes and cements, which are used with sand to make a mortar for binding the materials together. In very crude construction, mud and clay are used for a binding material. Foundation walls may be of stone laid dry; of concrete; of stone laid in Portland cement mortar or half-cement mortar, the latter consisting of sand, cement, lime, with cement and

lime in equal proportions. In case of the soil under the building not being sufficiently firm, it is necessary either to drive wooden piles or to spread the foundation so far that the pressure per square foot on the soil will not be sufficient to cause the building to settle In Chicago the footings are very large, of steel beams and concrete, making what is practically a raft so that the building really floats on a soft soil. Where the foundations are under water, as under a bridge pier, it is necessary to adopt special methods, generally sinking caissons so that workmen may go down and work under water

The outer row of stones of a wall are termed the facing, those within the filling, those at the rear the backing A horizontal laying of either stone or bricks is a course, a sloped surface of a well is a batter, a protecting often projecting course on top is a coping A bond is a stone going through two or more courses to bind them together, a quom is a squared stone at a corner. a stretcher is greatest in horizontal length, a header shortest, the latter being a bond A cramp is a bar of 1ron or steel let into a wall to brace it Ashlar are squared stone; rubble irregularly shaped stone A corbel is a stone projecting as a balance-weight, a sill, a broad stone at the base of an opening; a template, a large stout stone for supporting the end of a girder or beam

Ashlar Facing.—The stonework of the outer face of a wall when it is cut and differs in character from the back of the wall is called ashlar The coursing of ashlar is done in different ways. The simplest form is when it is laid out in continued courses. In this case it is caller "regular coursed ashlar." Ashlar is also laid without long horizontal joints. In this case it is called "broken ashlar". This is generally used when stone cannot be easily obtained of equal heights. It takes longer to lay this up, which makes it cost more than the regular courses, but makes a very attractive looking wall, having more freedom and texture It is customary to cut the stone at the stone yard certain heights; for example, two, four, six and eight inches, so that they can be laid up without cutting any joint except the end joint, at the building. From three to six different heights are generally used, the larger number giving more variety than when the smaller number of sizes is used.

Coursed random ashlar has horizontal joints one-half to two feet apart, continuous Between these joints the stone is laid up irregularly. The other stone on the walls of a building are called trimmings, which include the molded work, the window sills, jambs and the quoins, which are the cornerstones of the building. The quoins and jamb stones, if of the same material, may be included with the rest of the ashlar. The part of the wall back of the ashlar (called the backing) is of cheaper stone or brick. It is never under eight inches thick when of brick, and if of stone the backing is thicker. This should be built and bonded in at the same time as the ashlar in order to make a solid wall. If the stones are not high, the thickness of the ashlar should vary so that the backing can bond in and it is generally specified that the ashlar should include one through bond stone in every 10 square feet of wall. If

the facing is thin (two inches to four inches), the pieces are clamped back into the backing by iron clamps Random rubble is where untrimmed stones are used, and selected to fit as

well as possible

In public work and important buildings, every stone should be shown on the drawings, except when random ashlar is employed. In this case the arrangement of the stone is made by the foreman on the building, to follow a sample piece of ashlar set up and approved by the architect Ashlar is usually from four inches to eight inches thick. In figuring the quantity an average of six inches in thickness is generally taken. The heights vary from 10 inches to 14 inches. For exterior work the ashlar should not be under four inches thick. The ashlar may be laid with V joints, or with rustication. In the latter case the face is generally rock-face or pointed and a draftline an inch wide is carried around the edge of the stone.

Bond stones are stones that go into the wall to hold the wall together. If there are many small stones these should be frequent. In laying out ashlar the bond should be arranged to give effective stone jointing. Sometimes the Flemish bond arrangement is used as in brickwork. Bond stones the full size of a pier are frequently used for caps and also placed at

intervals through the pier.

Brickwork.- Bricks are laid so as to distribute the load and tie the different portions of the wall together. Stretchers are brick which are laid showing their long side. Headers show the end of the bricks. Common bond is to lay the brick with stretchers for five courses and then lay headers for the sixth course Face brick bond is as a rule laid of stretchers and bonded either by clipping the corners of the bricks, which tie the face of the wall to the backing, or with metal wall ties, which are made of wire, crimped metal or of tin fastened to steel wire. Flemish bond is the bond which is most frequently used to give an interesting wall surface, more pleasing than what is obtained with common bond. It is laid we with alternate headers and stretchers. The up with alternate headers and stretchers. small piece inserted at the corners is called a closer. English bond consists of courses of headers and stretchers alternating. A variety of this, called English cross bond, has the alternate courses of stretchers arranged with the joints below the middle of the bricks above, making a figure resembling a cross Some-times every fifth course of brick is laid Flemish bond with the others straight bond Every fifth course may be set in or back an inch, forming rusticated work. When walls have hollow or "vaulted" spaces not over two inches wide in the centre the bond is made by bricks laid across the space and cut in diagonally, or by the use of metal ties every four to eight courses. In arches, the face of the arch is made with the same bond as that shown on the wall. Common arches are made with successive rings or rowlocks, of headers.

Bricks.— Despite the great increase of concrete and steel construction, brick seems to be used as much as ever, as they are not affected by the weather, fire or city atmosphere. which affects the softer building stones seriously. They are cheaper than stone and can be used with cut stone or terra-cotta trimmings. Hard burned bricks are used for piers, though not so

good for this purpose as stone work, and in very dry soils are sometimes used for founda-tion walls. If there is any dampness of the soil, the outside of brick foundation walls is sometimes painted with water-proof paint. Bricks are made from sand and clay, the clay in different localities making bricks of different characteristics A sandy clay is most desirable. For the better kinds of brick, clay is often chosen from different places and combined with the greatest care (See Brick-Making Ma-CHINERY). Terra-cotta and pottery are burned in kilns which are arranged to let in heat half way up the kiln so that it will be drawn down on to the pile of terra-cotta and through the floor of the kiln into the chimney This is said to give a more even heat. If there is iron in the clay the color of the brick will be red; the ordinary white bricks are generally due to lime. The proportion of iron makes the red of various shades, according to the amount. Lime and iron make a cream-colored brick. Brown bricks are due to the presence of magnesia; and magnesia and iron make a yellow brick. Different clays give varying color effects, and the mixture of clays with mortar colors, or painting the exposed surfaces, gives desired effects. Bricks should not absorb more than from one-twentieth to one-tenth of their weight of water. This is a test that can be easily applied. Soft bricks may absorb as much as a quarter of their weight. Bricks should ring when struck, as cracked or soft bricks will give a dull sound They should not have any cracks or large lumps or foreign substance, such as lime or coarse gravel. They should run all the same dimensions with true surfaces, though for rustic work rough bricks are often desired. The approximate size of a brick is 2 inches × 4 inches × 8 inches. In the Eastern States 734 inches × 334 inches × 234 inches; but in the Western States the dimensions are slightly larger. In every case where brick work has to be figured for cutting stone trimmings, the brick should be laid up and measured. Pressed brick are generally 83% inches × 41% inches × 23% inches in size Roman brick is 12 inches long and 11/2 inches thick. Norman brick is 12 inches long and 2 inches thick. Bricks weigh four or five pounds apiece.

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MASOOLA, ma-soo'la, a boat common on the east coast of India, adapted to be beached on the surf-beaten shore. The planks are sewed together with coir, over wads of the same material, which press upon the seams. The boats are 30 to 35 feet long, 10 to 11 feet beam, 7 to 8 feet deep, and are rowed by 12 men, oars double banked, and a steersman with an oar at the stern.

MASORA, măs'ō-ra, or MASSORAH, MASSORETH, a Hebrew word signifying "tradition," the name of a collection of notes referring to the Hebrew text of the Old Testament, and written in Chaldee chiefly on the margin of Hebrew manuscript. These notes

are various in their character, critical, grammatical and explanatory Since in early Hebrew writing no vowel signs appeared, great confusion arose in time from the many modes of reading and supplying vowels to the consonants. The Masora set a fixed reading to each word and thus put an end to the multiplicity of readings. At what time the accumulation of these notes was commenced cannot be ascertained. According to some Jewish writers the notes are in some cases as old as the time of Moses; according to others they were begun in the time of Ezra. It is more likely that they are the result not of one period but of many centuries of compilation and emendation. A useful edition of the Masora is the translation of Dr. Ginsburg (3 vols., London 1880-87). See Judaism.—The Massorah. Consult Cornely, (Introductio in V. T. Libros Sacros) (Vol. I, Paris 1894); Ginsburg, C. T., (Introduction to the Hebrew Bible) (London 1899); Driver, S. R., (Notes on Hebrew Text of the Books of Samuel, with Introduction to Hebrew Palæography) (2d ed, Oxford 1913); Harris, (Rise and Development of the Massorah) (in Jewish Quarterly Review, Vol. I, London 1889).

MASPERO, Sir Gaston Camille Charles, gas-tôn ka-mēl shārl mas-pē-rō, French Egyptologist: b. Paris, 23 June 1846; d. 30 June 1916. He studied in the Lycée Louis-le-Grand, 1853-65, and before entering the École Normale in 1865 had already made considerable progress in the study of Egyptology. He remained in the latter college two years and attracted the attention of Mariette, the distinguished Egyptologist. In 1867 he published in the Revue Archéologique an Egyptian text and translation under the title 'Stèle du Songe,' and in the same year appeared separately his 'Mémoire sur la grande Inscription d'Abydos et la Jeunesse de Sésostris On leaving the École Normale he went to South America to carry out researches in the Quichua language. Further memoirs on ancient Egypt extended his reputation and se-cured his appointment in 1869 as professor of the Egyptian language and archæology at the Ecole des Hautes Etudes. In 1871 he issued an important essay, 'Des Formes de la conjugaison en Egyptien ancien, en démotique et en copte'; and in 1873 'De Carchemis Oppidi Situ et Historia antiquissima? and 'Du genre epistolaire chez les anciens Egyptiens? In 1874 he succeeded Rougé as professor of Egyptian philology and archæology at the Collège de France. Sent to Egypt in 1880 as head of a government archæological mission, he succeeded Mariette in the following year in the directorship of excavations and antiquities. He founded and directed an archæological institute at Cairo, had charge of the museum at Bulak, now in Gizeh, carried out many excavations, with important results, and in 1886 returned to France to resume his duties at the college. In 1899 he again went to Egypt as director of excavations and antiquities. In 1914 he left Egypt and became permanent secretary of the Academy of Inscriptions and Belles-Lettres. Maspero's great work is his 'Histoire ancienne des Peuples de l'Orient' (1875), which has been republished in an enlarged and revised form (1894-99). The three volumes of the later edition have been translated into English under the titles 'The Dawn

of Civilization (1894), 'The Struggle of the Nations' (1896) and 'The Passing of the Empires' (1900). His other works comprise the following 'Contes populaires de l'Egypte ancienne' (1883), translated by him; 'Etudes Egyptiennes' (1886-91), 'Archéologie Egyptienne' (1887; Eng trans. 'Egyptian Archaelogy,' 1888); 'Lectures historiques' (1890; Eng trans, 'Life in Ancient Egypt and Assyria,' 1892); 'Etudes de Mythologie et d'Archéologie Egyptiennes' (1893), invaluable to the student of the religion of ancient Egypt, besides contributions to the 'Mémoires' of the French Archæological Mission at Cairo; 'Les momies royales de Deir-el-Bahari' (1889); 'Causeries d'Egypte' (1907; Eng. trans, as 'New Light on Ancient Egypt, 1909); 'Egypt, Ancient Sites and Modern Scenes' (1911); 'Art in Egypt' (1912), and text and translations of the inscriptions upon the pyramids of the fifth and sixth dynasties in Recueil de travaix relatifs à la philologie et parchéologie égyptiennes et assyriennes (Vols. I-XIV), etc In 1879 Maspero was made a knight of the Legion of Honor, and in 1895 commander In 1883 he became a member of the Académie des Inscriptions, and in 1887 an honorary Fellow of Queen's College, Oxford, and an honorary D'CL of that university In 1909 he was made knight commander of Saints Michael and George See Egyptology.

MASQUERADE, măs-ke-rād', a popular amusement, in which persons of both sexes mask or disguise themselves and engage in dancing or festivities. Masquerades date from a very early period in which they were connected with religious ceremonials and observances. We find traces of the masque in the Bacchanalia of Greece, the Saturnalia of Rome and in the Purim of the Hebrews. In the Middle Ages they were at times held in the churches, for instance the ceremony of the boy bishop, the feast of fools, etc. The clergy succeeded in putting a stop to these relics of paganism in connection with Christian worship in the 16th century. Masquerades of the modern purely secular type are said to have been the invention of Granacci, an Italian, who lived in the beginning of the 16th century. See Carnival; Festival.

MASQUERAY, Emmanuel Louis, American architect: b. Dieppe, France, 10 Sept. 1861; d. Saint Paul, Minn, 26 May 1917. He was educated at Rouen and Paris. Having decided to become an architect he studied at the École des Beaux Arts, Paris, and in 1879 was awarded the Deschaumes prize by the Institute of France He also received the Chandesaigues prize in 1883. While in Paris he was also an attaché of the Commission des Monuments Historiques. Mr. Masqueray came to New York in 1887, and was at first connected with the office of Carrere and Hastings and later in the office of William M. Hunt. He opened an office here in 1893 and founded the Atelier Masqueray for the study of architecture according to French methods. This was the first wholly independent atelier opened in this country. His reputation became international in 1901 when the commissioner of architects of the Saint Louis Exposition selected him to be chief of design or consulting architect. This monumental undertaking included the Trans-

portation Palace, the Agricultural, Horticultural, Fisheries and Forestry buildings, the Cascades, the Colonnade of States, pavilions, the Louisiana Purchase monument, 12 bridges, music stands and all the decorative architecture in the grounds Mr. Masqueray was the architect of the famous cathedral of Saint Paul in Saint Paul, Minn, and the pro-cathedral of the Immaculate Conception in Minneapolis, Minn He was a charter member of the Society of Beaux Arts Architects and the Architectural League of New York, the New York Chapter of the American Institute of Architects, as well as the national organization

MASQUES. The old masques, fashionable in England in the 17th century, were in reality the kind of private theatricals that then generally prevailed at the courts of Europe Their name is understood to have originated from the use of the head masque, representing either romantic, historical or allegorical types on occasions of festivity or solemnity. The first of these masques (or ballets, as they were called in Italy and France) that we find recorded was that given by Bergonzio di Botta, at Tortona, to celebrate the marriage of the Duke of Milan in 1489 It was the talk of all the élite of the Western World Originally a parade or festival, a form of dramatic masque quickly developed in England under the wits of men as deft as Ben Jonson and Fletcher, aided and abetted by the master-designer, Inigo Jones (qv.), reaching a height of tawdry theatrical beauty that died out almost as quickly as it had flamed. At Versailles and other courts the masque or ballet survived for over a century longer. The masque of to-day is philosophical in character. It is the drama of personified ideas It is akin to allegory. Its dramatic purpose is the presentation of universal truths; and in this indirect way to bring their lessons home to the mind and heart alike. The pageant and masque are distinctly antithetical in character The one is essentially concrete, the other sessentially abstract. The one depends on realism to tell its story, the other depends on symbolsm, though either may realism to tell its story. symbolism, though either may make use of the elements of the other in subordination Mr. Percy Mackaye's 'Masque of St. Louis,' performed in that city in 1914, was perhaps the soundest achievement of the American poet in this new form which has yet to find its authenins new form which has yet to find its authentic masters. During the Shakespearean tercentenary celebrations of 1916 many commemorative masques were written and performed. For these and sundry lists of "Masques and Festivals" lately held in the United States consult the bulletins of the American Pageant Association. See Festival; PAGEANT. The standard authorities on the English masques are Evans, H A, English English masques are Evans, H A, 'English Masques' (London 1898); Reyher, Paul, 'Les Masques Anglais: étude sur les ballets et, la vie de cour en Angleterre, 1512-1640' (Paris 1909); Brotenak, Rudolf, Die Englischen Maskenspiele' (Vienna 1902).

MASS, in physics, the quantity of matter in a body. The mass of a body is the same wherever the body may be in the universe. Two bodies have equal masses if the gravitating forces with which another body acts upon them are exactly equal at equal distances. (See Gravitation). Hence two bodies have equal masses if their weights are the same at

the same place on the earth; so that if the metallic "weight" used by a grocer is carried from place to place, the quantities of sugar and tea balanced by it in a good pair of scales will always be the same, for the mass of tea or sugar is in every case equal to the mass of the metalic "weight". It is to be clearly understood that as the force of gravity is different at different places on the earth, the weight of any body is different at different places. To distinguish between the mass (or quantity of matter) and the weight (or force which tends to move it downward) of a body is very important in beginning the study of physics.

MASS, The. According to the teaching of the Catholic Church, the Eucharist is the Sacrament which contains the body and blood, soul and divinity, of Jesus Christ under the appearances of bread and wine At the Last Supper (see Lord's Supper), the night before He died, Christ, in the presence of the 12 apostles, instituted the Eucharist (q v) by taking bread, giving thanks, blessing the bread, breaking it, and giving it to the apostles, saying, "Take ye and eat. This is my body," and then by taking the cup of wine, giving thanks, bless-"The for a commemoration of me" The Church teaches that, when Christ said "This is my body," the substance of the bread was, by His almighty power, changed into the substance of His body, and that, when He said "This is my blood," the substance of the wine was similarly changed into the substance of His blood, while the appearances of bread and wine remained The Church further teaches that the change of bread and wine into the body and blood of Christ, called Transubstantiation (Apr.) tiation (q.v.), continues to be made by Jesus through the ministry of His priests, to whom through the apostles and their successors, He gave this miraculous power when He said, "Do this for a commemoration of me" The priests exercise this power of Transubstantiation through the words of consecration in the Mass. What, then, is the Mass? The Mass is the solemn memory, with a narrative, of Christ's passion and death. It is the perpetual sacrifice of the New Covenant. In the catechism it is described as the unbloody sacrifice of the body and blood of Christ. It is, specifically, a sacrifice of adoration, thanksgiving, propitia-tion, and impetration. As, in the offering of this sacrifice, certain words and actions in fixed form are used, the Mass may be defined as the aggregate of prayers and ceremonies which constitute the service of the Eucharist in the Latin, that is, the Roman and Gallican, rites.

This service was known at first by many names: Εὐχαριστία, gratiarum actio, thanks-giving; Λειτουργία, liturgy, rite; προσφορά, oblatio, offering; κλάσις ὁρτου, fractio panis, breaking of bread; κυριακὸυ ὁρεπνου, cœna Domini, the Lord's supper; κοινωνία, communio, communion; σύναξις, συνέλευσις, meeting; solemnia; dominica solemnia; dominica passio; spirituale ac cœleste sacramentum; Dominicum; passio; sacrificium Λειτουργία still survives in the Eastern Church, and "holy liturgy" corresponds exactly to the word Mass. This latter

term has become the recognized and almost exclusive technical name for the liturgy of the West Its derivation is even yet not quite certain; but it is generally said to be a late Latin verbal noun for missio (=dimissio), from the verb mittere, to send, send away. Primarily, missa was used in the sense of "dismissal" with reference to the concluding part of the service, and then, by a gradual process well known to linguists as well as to students of liturgy, it was extended to the whole rite. The first time we know for certain that it was employed in its present sense was in the 4th century, about 385 or 386, in a letter of Saint Ambrose to his sister, in which occurs the statement, missam facere capt (=I begin to say Mass) A 2d century instance of the use of the word missa in this sense is of doubtful authenticity From the 4th century onward it becomes more and more frequent, until in the 'Sacramentarium Leonianum' (Leonine Sacramentary), of the 5th or 6th century, it is understood throughout (Item alia=Item alia missa), and in the 'Liber Sacramentorum Romanæ Ecclesiæ,' usually known as "The Gelasian Sacramentary," of the 6th or 7th century, it is constantly expressed. Thereafter, while Eucharist remains the normal name for the sacrament, Missa, or one of its derivatives in other languages like Mass in English or Messe in French, has been the regular title given to the Eucharistic sacrifice in the Roman and Gallican rites.

So much for the word, which is clearly much later than what it denotes The history of the Mass itself has its origin in the New Testament in the four accounts of the Last Supper found in Matthew xxvi, 26-28; Mark xiv, 22-24; Luke xxii, 19-20; and Paul, 1 Cor xi, 23-26. What Christ then did is the foundation of the Mass It is because He told the apostles to do, in memory of Him, what He himself on that occasion had done, that the liturgy of the Mass came into being and has continued through the ages. That liturgy, fluid and variable in detail, but uniform in outline and in many formulas, always the same in essentials, and from constant repetition tending ever to become fixed, is traceable with more or less certainty through the 1st century in different parts of the New Testament, in the 'Didache' or "Teaching of the Twelve Apostles" (c. 80-100), in the 'First Epistle of Saint Clement of Rome to the Corinthians' (c. 90-100), in the 'Epistle of Barnabas' (c. 90-98), and in the letters of Saint Ignatius, bishop of Antioch (d. 107). In the 2d century there is very probably an interesting allusion to the Mass from the outside, in a letter written by the pagan, Pliny the Younger (C. Plinius Cæcilius), governor of Bithynia, to the Emperor Trajan about 111-113 The eucharistic service, mentioned by Saint Polycarp, bishop of Smyrna (martyred c 155), by Athenagoras of Athens (c 177), and by Theophilus, bishop of Antioch (c. 180), is set out in considerable descriptive detail by Saint Justin Martyr (put to death, c. 165) in his 'First Apology' addressed to Antoninus Pius (138-161), and is also treated of by Saint Irenæus, bishop of Lyons (d. c. 202). In the 3d century we already see traces of those different practices in different countries which led to the different liturgies. For the rite followed in

Alexandria and Egypt, we have as spokesmen Clement of Alexandria (d. c. 215), Origen (d 251), and Dionysius of Alexandria (d 264); for that of Antioch and Syria we have the fragmentary outline given in the second book of the 'Apostolic Constitutions' (which, however, was not written down until the 5th century as the $\Delta \iota a \tau a \gamma a \iota$ $\tau \delta v \dot{a} \gamma \iota \omega v \dot{a} \pi \sigma \sigma \tau \delta \iota \delta \omega v$, as well as the complete text of a liturgy in the eighth book of the same work; for Rome and the West we have vague allusions in the writings of Hippolytus (d. 235) and Novatian (c. 250), and for the African Church or Church of Carthage we have Tertullian (d c. 270). 220) and Saint Cyprian, bishop of Carthage (d. 258). The liturgy given in the eighth book of the 'Apostolic Constitutions,' as well as being an early form of the rite of Antioch, is also possibly an example of an early type of the rite of the whole Church. When we reach the 4th century we have much fuller liturgical information, at least for the East, not only in the writings of Saint Athanasius (d 373), Saint Basil (d. 379), Saint Cyril of Jerusalem (d 386), and Saint John Chrysostom (d 407), but also in the εὐχολόγια, or service books, which from about the end of this period began to be compiled for Church use From this time, too, we have the specifically different rites which were already foreshadowed in the 3d century It is generally accepted that the fairly uniform type of liturgy previously used everywhere developed into four great parent-rites, from which all others now in use in Christendom are derived These four are the liturgies of Antioch, Alexandria, Gaul, and Rome

I The rite of Antoch, found pure in the Greek 'Apostolic Constitutions,' was modified at Jerusalem into the Liturgy of Saint James, which itself took the place of the older liturgy at Antioch, and was used throughout the whole patriarchate, embracing all western Syria. This modified liturgy is found in (1) the Greek Saint James, now used only once a year at Zacynthus on 23 October, the feast of that saint, and at Jerusalem on 31 December; (2) the Saint James in Syriac, used by the Syrian Jacobites and Uniates; and (3) the Maronite rite, used in Syriac and also in Karshunn, that is, Arabic written in Syrian characters. The second rite derived from the primitive one of Antioch is the East-Syrian or Chaldean, which is found in two forms, (1) that used, in Syriac, by Nestorians and Chaldean Uniates, and (2) the Malabar rite, which is used, also in Syriac, by Malabar Uniates The third derivative of Antioch is the Byzantine rite, used in Greek, Arabic, Old Slavonic, Rumanian, and many other languages, by all the Orthodox and by Melchites and other Byzantine Uniates Next to the Roman Mass, this is the most wide-spread Christian liturgy. The fourth and last rite derived from Antioch is the Armenian, which is used, in classical Armenian, by Armenians, whether Gregorian (i.e., schismatical) or Uniate. II The second eastern rite, the Alexandrian, gives us (1) the Greek Liturgy of Saint Mark, which is now no longer used; (2) the Saint Mark in Coptic, used by the Copy both Monophysite and Uniate; and (3) the Ethiopic liturgy, used by the Monophysite Church of Abyssinia. The two great western parent liturgies are the Gallican and the Roman. III. The Gallican rite, in Latin, was used in

North Italy, Gaul, Germany, Spain, Britain, and Ireland. It was imported about the 4th century from the East, probably from Antioch From about the 8th century it began to be gradually supplanted by the Roman rite, which became itself considerably Gallicanized in the process By the 10th or 11th century the Gallican had entirely given way to the Roman rite, except in one or two places It still survives under the title Ambrosian at Milan, in Italy, and under the title Mozarabic at Toledo, in Spain. In each case it is greatly Romanized, particularly so at Milan IV. Finally, we have the liturgy of Rome The original pure Roman nte is now no longer used, nor is the African rite, which belonged to the same family and had many features in common with the present Roman Mass, not the least being that its language was Latin even at a time when Greek was still employed at Rome and elsewhere. The present Roman rite, by far the most widespread of all, is used, in Latin, by nearly the whole Roman patriarchate. It occurs, however, in a Slav dialect in parts of Dalmatia and occasionally in Greek at Rome. In parts of southern Italy, Sicily, and Corsica, although they belong to the Roman patriarchate, the Byzantine rite is used. There are various mediæval modifications of the Roman rite peculiar to the religious orders of the Dominicans, Carthusians, and Carmelites. There were also modifications adopted in certain dioceses, and a few of them, Lyons for example, still keep these local forms; but in most cases the local usage has been abolished.

In the early period the liturgical language used at Rome was Greek, for Greek was spoken by the Roman Christians as well as by those of other centres of Christianity, such as Alexandria, Antioch, and Jerusalem. For example, Pope Clement I (c. 91-104) uses Greek in that famous 'First Epistle to the Corinthians,' to which reference has been already made, and the earliest inscriptions in the Roman cata-combs are certainly in Greek. As far as is known, the first Christians to use Latin were those of Africa (Carthage). Pope Victor I (190-202), who was born in Africa, is often said to have been the first Roman pontiff to use it; but this has been disputed. The question turns on whether Victor or Saint Cyprian was the author of the treatise (De Aleatoribus.) The 3d century popes, Cornelius (251-53) and Stephen (254-57), write in Latin. It may perhaps be fairly said that from about the 3d century Latin became the customary language spoken by Christians at Rome, and gradually from that time onward the only one. It is difficult to say when Latin replaced Greek for Church use. Some authorities place the change at as early a date as the second half of the 3d century; others are of opinion that Greek remained the liturgical language until the end of the 4th century. At all events, in Pseudo-Ambrose 'De Sacramentis' (c. 400) and in a letter of Pope Innocent I (401-17) to Decentius of Eugubium (c. 416) we find that the Mass was then said in Latin. It is probable that there was a transition period, during which the two languages were employed side by side. We know from the first Roman Ordo (c. 770) that as late as the 8th century lessons were read and psalms were sung in Greek. As a matter of fact, Greek has not, even now, entirely disappeared We still have the Kyrie Eleison in every Mass and the Trisagion, Agios O Theos (O Holy God), Agios ischyros (O Holy Strong One), Agios athanatos, eleison imas (O Holy Immortal One, have mercy on us), in the Mass

of the Presanctified on Good Friday

The development of the Roman Mass into its present form is also difficult to trace, at least in some of its earlier stages. Clement I of Rome, Justin Martyr, Hippolytus, and Novatian are in substantial agreement as to the liturgies which they describe or mention; but our information as to the developments of the Roman rite during the latter half of the 3d and nearly the whole of the 4th century is extremely scanty. What we find is that between the 2d and the 5th century certain important changes were made. When we reach the 5th century we are on surer ground, for the 'De Sacramentis' and Innocent the First's letter to Decentius prove not only that the Mass was then said in Latin but also that it is in essence the rite still in use. In the 'Gelasian Sacramentary,' of the 6th or 7th century, showing the service considerably shortened, we have what is practically the present Roman Mass. Pope Saint Gregory I (590-604) made certain modifications, and left the Roman liturgy largely in the state in which it exists to-day. He it was, in particular, who gave the final touches to the Canon. "No pope," says Benedict XIV (1740-58), "has added to or changed the Canon since Saint Gregory." The Council of Trent (1545-63), wishing uniformity everywhere in the celebration of the Roman Mass, appointed a commission to examine and revise the Missal and restore it to its earlier form, "according to the custom and rite of the holy Fathers." This commission, named on 16 Feb. 1562, had not finished its labors at the close of the Council, 4 Dec. 1563, and its authority was continued and action on its report left to the Pope, Pius and action on its report left to the Pope, Plas IV (1559-65). It was not, however, until the reign of his successor, Pius V (1566-72), that the revision was completed. On 14 July 1570 the reformed Missal—'Missale Romanum ex decreto ss. Concilii Tridentini restitutum'— was published by the Bull, Quo Primum, commanding that that Missal alone should be used wherever the Roman rite is followed. That command put an end to most of the mediæval derived rites. There was, however, an exception. Any liturgy that could prove a prescriptive right by an existence of not less than two centuries was allowed. It is by virtue of this exception that the independent Gallican liturgies at Milan and Toledo, as well as the modified rites of certain religious orders and the local usages of some dioceses, were preserved. This Missal of Pius V is the one still in use. It has, however, since undergone various corrections in non-essentials. A second revised Missal was published by Clement VIII (1592-1605) by the Bull, Cum Sanctissimum, of 7 July 1604. Again on 2 Sept. 1634 Urban VIII (1623-44) by the Bull, Si quid est, published yet another revision. The last revision of the text, with a correction of the rubrics, was made by Leo XIII (1878-1903). His missal—'Missale Romanum ex decreto ss. Concilii Tridentini restitutum, S. Pii V Pont. Max. iussu editum, Clementis VIII, Urbani VIII et Leonis XIII auctoritate recognitum,— was published in 1884. The

changes effected by Pius X (1903-14) have reference to the music

Of the Mass, so instituted, developed, reformed, authorized, and promulgated, it remains to say a few words. It is, indeed, not within the scope of the present article to give in detail the many complicated rules and the minute rubrics that are to be observed in the celebration of Mass These things, which must be mastered before ordination by every aspirant to the priesthood, are to be found fully set forth in books on ceremonial All that can be given here is a general outline of the prayers and of some of the ceremonies used. The ers and of some of the ceremonies used. The norm is Missa Solemnis, or High Mass, sung by celebrant, deacon, subdeacon, and choir The following sketch therefore refers to High Mass and, further, to High Mass as celebrated on an ordinary Sunday. The procession, consisting of thurifer, acolytes, master of ceremonies, subdeacon, deacon, and celebrant, all appropriately vested in accordance with the rubrics, having reached the foot of the altar, the celebrant makes the sign of the cross and the celebrant makes the sign of the cross, and he and his assistants say certain preparatory prayers, including the 42d [43d in Rev. vers.] Psalm and the Confiteor or General Confession Going up to the altar, the celebrant says cliently two chort prayers solving forguences. silently two short prayers asking forgiveness of his sins. Then, having blessed the incense and incensed the altar, he reads the Introit, consisting of an antiphon, a verse of a psalm, and the little doxology, Gloria Patri, etc. The Introit has previously been sung by the choir. The Kyrie Eleison follows, said by the celebrate that the constant of the celebrate that the constant is a second of the celebrate that the constant is a second of the celebrate that the celebra brant and the assistant ministers, and sung by the choir. The celebrant then intones the first words of the great doxology, Gloria in Excelsis Deo, and he and the ministers say the remainder of it together, while the choir sings it. Turning to the congregation, the celebrant greets them, in his singing voice, with the salutation, Dominus vobiscum (The Lord be with you), to which the choir answers, Et cum spiritu tuo (And with thy spirit) He then spiritu tuo (And with the ton answers, He then sings the word, Oremus (Let us pray), and, turning his face to the altar, he sings the prayers known as the Collects, which are different every day. These are followed by the Epistle, which the celebrant reads while the subdeacon chants it. After the Epistle comes subdeacon chants it. After the Epistle comes the Gradual, consisting of two separate chants, of which the first is the Gradual proper and the second is the Alleluia or, in Lent and on certain fast days, the Tract. Five times in the year, as well as in all Requiem Masses, the Gradual chants are followed by a canticle known as the Sequence. The celebrant then says silently the prayers, Munda cor meum, etc. (Cleanse my heart, etc.), and Dominus sit, etc. (May the Lord be in my heart and on my lips, etc.), reads a selection from one of the four Gospels, and blesses the incense. The sub-deacon then holds the Gospel-book and the deacon incenses it, and then sings the Gospel as previously read by the celebrant. At the end the response, Laus tibi, Christe (Praise to thee, Christ), is said At this point, a sermon, of course. After the sermon, the celebrant intones the first words of the Nicene Creed, Credo in unum Deum (I believe in one God), and says the remainder, which is sung by the choir. When the singing of the Creed is fin-

ished, the celebrant sings Dominus vobiscum and, after the response as before, he sings the word Oremus (Let us pray). Then follow in order the three principal parts of the Mass. namely, the Offertory, the Consecration, and the Communion The Offertory is the beginning of the action of sacrifice While the choir sings the Offertory antiphon, the celebrant offers the bread, wheaten and unleavened. with the prayer, Suscipe, sancte pater, etc. (Accept, holy father, etc.) Then, blessing the water and mixing a little of the water with the wine in the chalice, he says the prayer, Deus. qui humanæ, etc. (God, who didst wonderfully create, and still more wonderfully renew, the the chalice, he and the deacon say, Offering the chalice, he and the deacon say, Offerings tibi, Domine, calicem salutaris, etc (We offer unto thee, Lord, the chalice of salvation, etc). Bowing before the altar, the celebrant says the prayer, In spiritu humilitatis, etc. (In the spirit of humility, etc.), and then blesses the bread and wine with the prayer, Veni, sanctificator, etc. (Come, Sanctifier, etc.). He then blesses the incense and incenses first the bread and wine with the prayer, Incensum istud, etc. (May this incense, etc.), and then the altar with the prayer, Dirigatur, Domine, oratio mea, etc (Let my prayer, Lord, be directed, etc.) Handing back the censer to the deacon, he says, Accendat in nobis Dominus, etc (May the Lord enkindle in us, etc) Here the celebrant, the ministers, the clergy present, and the congregation are all incensed Washand the congregation are all interised washing his fingers at the side of the altar, the celebrant recites the Lavabo, that is, the last seven verses of Psalm 25 [26], concluding with the little doxology Then, bowing before the middle of the altar, he says the prayer, Suscipe, Sancta Trinitas, hanc oblationem, etc (Receive, holy Trinity, this oblation, etc). He then turns to the congregation and gives the then turns to the congregation and gives the exhortation, Orate, fratres, etc. (Pray, brethren, etc), to which the ministers make answer, Suscipiat Dominus sacrificium, etc (May the Lord receive the sacrifice, etc.). Next follow the Secreta, or secret prayers, which, like the Collects, vary every day, but are said, not sung, by the celebrant. The last Secret, which ends the Offertory act, he brings to a close with the Ecphonesis, Per omnia sæcula sæculorum, sung aloud, to which the choir responds, Amen. There follow three short chants sung dialogue-wise by the celebrant and the choir. The cele-brant then sings the Preface, which ends with the Sanctus, etc., said by him and sung by the choir. At the Sanctus a bell is rung thrace. The Canon, which is the fundamental part of the Mass, follows Its form never varies, except for slight charges (1) when the Barren the Mass, follows Its form never varies, except for slight changes (1) when the Roman See is vacant, (2) when the Episcopal See is vacant, (3) when the Mass is celebrated (a) in Rome and (b) in some French churches, (4) Rome and (b) in some French churches, (4) when it is celebrated by (a) a Pope or (b) a bishop, (5) when a bishop is being consecrated, (6) on Maundy Thursday, and (7) at the time of the five chief feasts of the year, namely, Christmas, Epiphany, Easter, Ascension, and Pentecost The Canon is said in a low tone (secreto) by the celebrant. He beseeches God to accept and bless the sacrifice, and to guard and protect the Church, the Pope, and the bishop; he prays for the living, present and absent; he commemorates the saints; he again

begs the acceptance of the sacrifice; he asks for peace and for deliverance from eternal damnation; he once more implores God to bless, approve, and ratify the oblation, so that it may become the body and blood of Jesus Christ Then, reciting what Christ did with the bread the day before He suffered, he consecrates the Host by saying, secretly, plainly, and attentively, the words, Hoc est enim corpus meum (For this is my body) Immediately he genuflects on one knee and adores and elevates the Host, to show it to the people. Next, rectting what Christ did with the cup of wine, he consecrates the wine by saying the words, Hic est enim calix sanguinis mei, novi et æterni testamenti mysterium fidei: qui pro vobis et pro multis effundetur in remissionem peccatorum (For this is the chalice of my Blood, of the new and eternal testament. the mystery of faith. which shall be shed for you and for many, for the remission of sins) Adding the words, Hæc quotiescumque seceritis, in mei memoriam facietis (As often as ye do these things, ye shall do them in remembrance of me), he again genuflects on one knee and adores the precious Blood and elevates the chalice containing it. During each elevation, a bell is rung thrice, additional lighted candles are borne by the acolytes, and the thursfer incenses thrice the consecrated bread and thrice the consecrated wine. Proceeding with the Canon, the celebrant says the Anamnesis prayer, in which a solemn commemoration is made of Christ's passion, resurrection, and ascension, and offers to the Lord the victim now on the altar, asking the Almighty Father to accept the offerings, and to command them to be carried by the hands of the holy angel to the altar on high, so that those who receive the most sacred Body and Blood of His Son may be filled with all heavenly blessing and grace. He next prays for the dead, prays again for the living, and makes a further commemoration of the saints, closing with the second Ecphonesis, Per omnia sæcula sæculorum. The answer, Amen, sung by the choir, brings the Canon to an end. Here follows that part of the Mass known as the Communion The celebrant sings a short exhortation and clause, and then sings the Pater Noster as far as the word, tentationem The choir sings the last petition, Sed libera nos a malo (But deliver us from evil). After this comes an Embolism, containing a further prayer for deliverance from evil and for peace, said by the celebrant, and ended by the third Ecphonesis, the words of which are the same as those of the two former ones. During the last part of the Embolism, he breaks the Host in the middle, over the chalice. Following the Ecphonesis and its response, he sings the greeting, Pax Domini sit semper vobiscum (May the peace of the Lord be always with you), to which the choir replies, Et cum spiritu tuo. Putting a particle of the Host into the chalice, with the prayer, Hæc commixtio et consecratio, etc (May this mingling and consecration, etc), he genuflects, bows down, strikes his breast thrice, and says the Agnus Dei, etc. (Lamb of God, etc), which contains two petitions for mercy and one for peace. The choir sings the Agnus Dei. The celebrant, having made a further prayer for the peace and unity of the Church gives the bigs of peace to the deacon. Church, gives the kiss of peace to the deacon,

who in turn gives it to the subdeacon, and he in turn to the clergy present. The celebrant then prays for deliverance from his iniquities and from all evils, and asks that the participation of Christ's body may not turn to his judgment and condemnation, but may profit him to the safety and health of soul and body. Having said the words, Panem coelestem accipiam, et nomen Domini invocabo (I will take the Bread of heaven, and will call upon the name of the Lord), he recites three times the Domine, non sum dignus, etc (Lord, I am not worthy, etc.), a bell being rung each time, and, with specified and appropriate short prayers, he eats the consecrated bread and drinks the consecrated wine. During the two ablutions, that is, of the chalice and of his fingers, which follow, he says two other short prayers. While the choir sings the antiphon known as the Commun-10n, the celebrant reads it, and this ends the Communion act The last division of the Mass now begins The celebrant, having sung the Post-Communion prayers, sings also the Dominus vobiscum, to which the choir gives the customary response Then the deacon sings, Ite, missa est (Go, the Mass is ended), or, in penitential seasons, Benedicamus Domino (Let us bless the Lord), and the choir answers, Deo gratias (Thanks be to God). The celebrant says a final prayer, Placeat tibi, Sancta Trinitas, obsequium servitutis meæ, etc. (Holy Trinity, may the performance of my homage be pleasing to thee, etc), and blesses the congrega-tion He then reads the last Gospel, which is normally the beginning of the first chapter of the Gospel of Saint John (vv. 1-14), and, when he finishes, the ministers respond, Deo gratias. So ends the Mass

Low Mass (Missa privata), in which the celebrant supplies the part of the absent ministers and uses the speaking instead of the singing voice, is a late abridgment It became a necessity when, in the early Middle Ages, the pious custom grew up for practically every priest to say Mass once a day By the 9th century we find that many priests were in the habit of saying Mass several times the same day By the 13th century this multiplication of Masses began to be forbidden. By special indult (1746) of Pope Benedict XIV, priests in Spain and Portugal were permitted to celebrate three Masses on All Souls' Day (2 November), a privilege extended quite recently to all other countries. The rule now is that, except on that day and on the feast of Christmas (25 December), when three Masses are also allowed, and on Sundays and certain holy days when, in case of necessity, authorization for two Masses Pius the Fifth's Missal (1570) recognized Low Mass and specifically arranged its order By direction of Pope Leo XIII certain prayers in the vernacular, in which the congregation par-ticipates with the celebrant, are recited after every Low Mass. In some countries (e.g., Ireland) the 129th [130th] Psalm (De Profundis) is said after the Low Mass and before the vernacular prayers There are special rites for a Pontifical Mass, high or low, and additional special rites for a Papal Mass. A Missa Cantata, without deacon and subdeacon, but with celebrant, choir, and singing as at High The Mass of the Mass, is a compromise.

rresanctified (Missa præsanctificatorum, κειτουργία τῶν προηγιασμένων), which is really not a Macs of all the not a Mass at all but a service of Communion from an oblation consecrated and reserved at a previous celebration, was once common in both the Eastern and the Western Church In the Byzantine rite such a service still occurs several times in the year, but in the Roman rite it is now used only on Good Friday. Conventual or Chapter Mass (Missa conventualis or capitularis) is an official Mass celebrated in such churches as are bound to have the whole office every day A Missa solitaria is a Mass said without an assistant. Such Masses, forbidden by many synods, may nevertheless be celebrated by dispensation given under special circumstances. Missa sicca, or dry Mass, was used on occasions when a real Mass could not be said, as, for example, at a wedding or a funeral in the afternoon consisted of the prayers of the Mass with the essential parts—offertory, consecration, com-munion—omitted. Varieties of the dry Mass were Missa nautica, said at sea when the rolling of the ship rendered a real Mass dangerous or impossible, and Missa venatoria, said for hunters. The dry Mass was in voque from at least the 14th century, but by the end of the 17th century it was nearly entirely abolished Requiem Mass is said for the dead, and Nuptial

Mass (pro sponso et sponsa) for a marriage In the early ages the Mass was divided into two distinct parts, the Mass of the Catechumens (Missa catechumenorum) and the Mass of the Faithful (Missa fidelium). This distinction, at one time fundamental, gradually disappeared as the discipline of the cate-chumenate fell into disuse It has now long been lost, and the division is so hidden in the present rite that but few people advert to it The Dominus vobiscum and the Oremus, following the Gospel (or the Creed, when it is said) and preceding the Offertory Act, show the line of demarcation.

The celebrant of Mass must be in priest's

orders and free of irregularity and censure. He must also be in the state of grace, and be fasting from at least the previous mid-night. He is bound to observe the rubrics and the laws concerning the matter (azyme bread and pure wine), the vestments, the vessels, and the ceremonies. Mass should be celebrated in a consecrated or blessed church and on a consecrated altar or altar-stone In speoratory or even in an ordinary room. It is offered in the morning, though, for good and sufficient cause, the time may be extended to a limited period after mid-day.

The two great distinguishing marks of the Roman Mass are (1) that it is a sacrifice and (2) that it supposes Transubstantiation. These were the two features to which the Reformers particularly objected. They took the position that "the Eucharist and Holy Supper of the Lord" was a remembrance of Christ and a solemn setting forth of his death, and not a sacrifice, and that Transubstantiation did not take place. They were anxious, indeed, to retain a Eucharistic service, but one stripped of what to them appeared to be its objectionable They were also insistent that the service should be in the vernacular, and that communion, when administered to the faithful,

should be administered under both kinds, that is, in the form of bread and wine, and not of bread alone as was the practice of the Catholic Church. At first they repelled the charge that they were opposed to the Mass, and the Augsburg Confession "protests against any notion that it abolishes Mass"; but the logic of events was too strong for this contention, and ultimately the Reformation, as far as it could, did away with the Mass In his Latin Mass (1523) and his German Mass (1526) Luther put forth the basis of the numerous liturgies promulgated by his followers in the 16th century. In the former he laid down the principle that "we cannot deny that Mass and the communion of bread and wine is a rite divinely instituted by Christ " He therefore allows the Mass, as it stood in the ancient missals, to be consonant with primitive purity, except the Offertory and the Canon, that is, everything that savored of oblation. He did not recognize Transubstantiation He developed instead the theory of Consubstantiation, according to which Christ's body and blood are really and corporeally present, during the celebration of the Lord's Supper, in, with, and under the substance of bread and wine, in a union not hypostatic, not of mixture, not of local inclusion, but wholly transcendent and mysterious, so that the elements may with propriety be termed either bread and wine or the body and blood of Christ. Zwinglius and Oecolampadius, and with them the main body of Helvetian Protestantism, went farther. They rejected all notion of a real presence, and recognized only figurative symbols in the elements which Christ had appointed as a commemoration of his death. Bullinger modified Zwinglius's doctrine without changing its essentials, and, by divesting it of its merely commemorative character and admitting the presence in the communion, gave it the form in which it was adopted by the Helvetic churches. Bucer did not acknowledge the local or real presence of Christ's body and blood in the bread and wine after consecration, but contended that the body and blood were really, and without figure, received by the worthy communicant, through faith. Calvin taught that the body of Christ is present in the Eucharist, but "dynamically," not objectively; that the believer partakes of it, but spiritually and by faith; that the elements are unchanged; and that therefore the Catholic Mass is idolatry. In England the Reformers maintained that in the Lord's Supper there is no Transubstantiation and no other oblation than a giving of thanks and a commemoration of the death of the Lord: in other words, that, as Cranmer phrased it, the Roman Mass is "heinous and abominable idolatry". These views found practical expression in the Book of Common Prayer, the first vernacular liturgy of the Church of England, published in the reign of Edward VI, and effective on Whitsunday, 9 June 1549 The Eucharistic part of the service was indeed named "The Supper of the Lorde and holy Communion, commonly called the Masse," but the whole of the oblation and offertory prayers were swept away and the former Canon changed in many of its most material parts. In the second Book of Edward VI, which went into force on 1 Nov. 1552, the word Mass was omitted, and any language in the Canon that might imply either the doctrine of Transubstantiation or of sacrifice also dis-The attitude of the Anglican appeared Church on this subject is crystallized in the 31st of the Articles of Religion: "Wherefore the sacrifices of the Masses, in which it was commonly said, that the Priest did offer Christ for the quick and the dead, to have remission of pain or guilt, were blasphemous fables, and dangerous deceits." Laws were enacted containing severe penalties for saying or hearing Mass. So important did it seem to condemn the Roman sacrifice that, for centuries, the occupant of the English throne was bound by the oath taken at coronation to repudiate the doctrine of Transubstantiation and of the Mass. It was not until 1910 that, by the Accession Declaration Act, the oath was purged of its objectionable clauses

Modern unbelief, which denies the divinity of Christ and rejects every supernatural institution, does not of course recognize the sacred character of the Mass Using the so-called historico-religious method, it accounts for the Eucharist and the Eucharistic sacrifice as a result of a spontaneous development in the religion founded by Christ, but this line of argumentation neither explains nor explains away the Mass, and succeeds only in raising still more difficult problems for solution.

Despite all the attacks to which it has been subjected, the Mass remains the great central act of sacrifice in the Catholic Church, the distinctive feature of the Catholic religion, the everlasting witness and guarantee of the bond which unites all Catholics with the Roman See. Catholics are required, under pain of grievous sin, to attend Mass on Sundays and holy days of obligation, unless prevented from doing so on reasonable grounds, such as sickness or too great distance from a church Some lax Catholics, it is true, shirk their duty in this respect; but the crowded condition of the churches both in town and country in every land during the hours of celebration shows how generally and how generously the law is observed. In practice, multitudes of Catholics hear Mass and receive holy Communion every day.

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MASS PRODUCTION. The term mass production may be fairly defined as the American contribution to methods of supplying the world's needs Created by the engineer-owner type of management which is prevalent in the United States, as distinct from the financier type of management, its major developments are more clearly traceable in the industrial history of the United States than elsewhere. The great size to which this facility has grown, the manifold nature of its operations and its prodigious volume and variety of output, foster the impression that mass production is a thing of great complexity, when in reality it represents the principle of extreme simplification as applied to manufacturing processes. Commodities themselves grow more complex—as the electric refrigerator compared with the icebox, or the motorcar compared with the wagon-but to prevent similar complexity reaching unmanageable proportions in the processes by which commodities are manufactured, the simplifying principles of mass production are adopted. Essentially, these consist in dividing a commodity into its constituent parts, defining the operations required to make each part, allocating each operation to its appropriate craft or machine, subassembly of lesser into major parts, and final assembly of the major parts to complete the commodity. This method in its origin and growth is not to be accounted for on any economic theory; it is purely the result of practical men's response to the requirements of the job; and, being yet in process of development, no economic theory thus far formed embraces all its relations and significance.

The principal effect of mass production on business procedure has been to convert industry from the old and relatively safe principle of restricted production for a known market and a calculable profit, to the new and riskier principle of producing for a market not yet in being, which the enterpriser hopes to develop by rendering goods more easily available through the lower prices made possible by the manufacturing economies that are attainable under volume production. The older method was a safer one for investments and permitted adjustment to shrinking markets without great loss, whereas the newer method is so dependent on uninterrupted volume production to at least 75 per cent of capacity, that almost invariably it incurs loss when required to adjust its vast facilities to less

than that volume. In this respect, mass production in the present stage of economic development is more profitable to society at large than to corporations practicing it. It represents a salient thrusting beyond the main line of general economic progress, an exposed position endangered by the failure of other economic factors to make a commensurate advance.

to make a commensurate advance.

Mass production eliminates none of the older developmental stages of manufacture. The handicraft stage is present in it, the craftsman still reigns supreme in the creation and design of the commodity: but at the point where formerly he

commodity; but at the point where formerly he was responsible for commodity reproduction also, he is now superseded. Reproduction of the commodity created by the master craftsman is now the function of the machine. Most of the commodities of the handicraft era were simple in form and purpose, employing at most one or two arts. They were later committed to the machine for the sole purpose of accelerating the repetitive process of reproduction. The machine produced more in less time at lower labor cost. During this transition period in American industry the machine became known as a "labor-saving" device or, less euphoniously, a destroyer of employment. But machine production of itself

does not constitute mass production.

The earlier years of the machine age were marked by the invention of newer and better methods of rendering old and basic services. In transportation for example, the locomotive and its train were substituted for the horse-drawn stagecoach. But, as in the case of the locomotive, the new service-delivering commodity was invariably more complex than the old, its structure contained more parts, its production involved more arts, and where the most elaborate stage-coach could have been produced by one or two skilled artisans, under no circumstances could a locomotive be commercially produced by merely manual workers however skilled Like the major proportion of capital goods today, it could not have been produced at all. Consequently, in its later development the machine came to be recognized as «laborserving» rather than «laborsaving,» because without it much of the present work of the world could not have been conceived, let alone performed. A million men massed together could build a pyramid but not a 125,000-horsepower steam turbine.

To the stage of creation, design and handicraft, and to the stage of machine reproduction of goods, was added the stage in which industry concentrated on the production of the parts of a commodity, constituting each part an industry in itself under one general management for the purpose of producing a particular result. This is mass production. And since it has come to its fullest development and use in the automotive industry and is now applied to the production of airplanes and other military weapons and vehicles, the method may be broadly described as follows: The commodity, say an automobile, is reduced to its major parts—frame, engine, axles, transmission, body, fueling, oiling, cooling, electrical systems, etc.—and each major part reduced to its constituent parts, as say, the engine to its 1,250 parts, or the gearshift to its 40 parts. Each part is separately studied with a view to its most efficient production in quantity and its perfect interchangeability with similar parts, the latter quality being achieved through the control of production processes by precision measurements which in certain instances approximate a ten-thousandth of an inch. This involves planning the layout of the shop so that the minor parts to be assembled into a major part may be conveniently located for easy handling, and so that major parts, when completed, may flow in sufficient quantity and orderly succession and converge at the exact place on the final assembly line where they are needed to give their degree of completion to the total process of assembling a car.

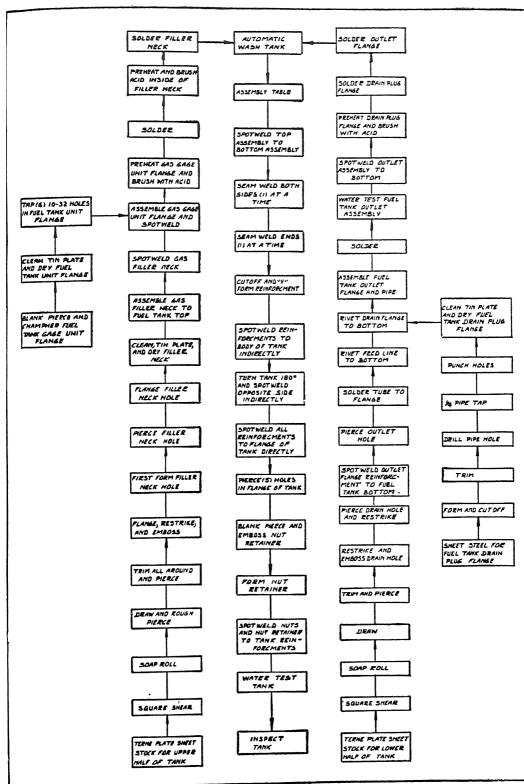
In recent years the number of parts thus involved has greatly increased. In the Model «Th period a car contained about 5,000 parts; in the Model «A» period about 6,000 parts; the medium price car of today contains between 15,000 and 16,000 parts, depending on the model Two opposing forces constantly operate within mass production practice: (1) the designer's and en-gineer's drive toward improvement and refinement which often increases the number of parts in the object improved; and (2) the manufacturer's drive toward fewer and simpler production operations, reducing the number of separate parts by simpler design or by integrating them into the unity of a larger design. To illustrate the first: Until recently the motorist shifted gears by using a lever that protruded from the transmission through the floor board of the car to within reach of the motorist's hand, it was a simple assembly of two parts. Engineers subsequently devised a remote control gearshift operated from the steering wheel and containing 40 parts. By such improvements the number of parts and operations involved in the manufacture of the car often are increased Illustrating the opposite tendency—the effort to reduce the number of parts and operations—production of a Ford steel crankshaft is a case in point. Formerly the forging of a crankshaft involved 62 fabricating operations. After five years of laboratory incubation and shop experiment with prolonged testing in actual use on 2,000 company service cars and trucks, a cast steel crankshaft was developed which reduced the number of fabricating operations to 54, at the same time reducing the weight, increasing the strength, and diminishing the waste attendant on its manufacture.

The layout of the mass production shop is a series of assembly and subassembly lines resembling the midrib and lateral veins of a leaf or the trunk and limbs of a tree. Each line begins at the edge of a stock pile, whence it takes the material to be shaped or assembled into the part which that particular line fabricates, and moves it along through a series of operations until it is complete. Thus the engine assembly begins with the cylinder block, which moves along the engine assembly line into which lateral or subassembly lines feed camshaft, crankshaft, pistons and rods, valves, flywheel, oil pump, etc., many of which are the product of more remote subassembly lines. For example, the oil pump is the product of a subassembly involving 13 distinct operations by as many men.

To illustrate the number of operations and the successive steps taken to perform them, the process of producing what most laymen would regard as a smilled part—a fuel or gasoline tank

—is now described.

(1) A steel sheet previously cut to size is taken from stock pile and run through soap roller to oil it for drawing. (2) It is inserted



Courtesy, Ford Motor Compan

Flowsheet showing successive basic operations (follow arrows) in mass production of a fuel or gasoline tank. (Comple survey of operations is outlined in text.)

into draw die to form lower half of fuel tank. (3) Placed in a trim and pierce die that trims it all round and pierces four holes (4) Placed in a restrike press that reshapes it and pierces drain plug flange hole. (5) Placed on spot welder that welds a reinforcement on end of piece (6) Inserted in die that pierces four holes in piece (At this point a feedline tube assembly arrives from an auxiliary line which represents six operations.) (7) Gas feedline outlet is riveted onto the piece. (8) Drain outlet flange is riveted on. (9) Tube of feedline is securely spot-welded to tank bottom. (10) Piece is placed on table (11) Is hung on overhead conveyor which carries it to solder line. (12) Twelve men solder hardware on the piece (13) It is then placed on overhead conveyor, carried through automatic wash of soda ash solution, to oxidize the acid, thence through a fresh water wash, lastly through a drying oven (14) Piece removed from conveyor, placed on assembly table The process thus far has engaged 28 men.

In the meantime the sheet forming the upper half of the fuel tank has been proceeding along a parallel line through similar operations, requiring 30 men, meeting lower half at the assembly table. At this point (15), upper and lower half of tank are assembled, spot-welded and seam-welded at ends. (16) Seam-welded on sides (17) External reinforcements are spot-welded to one side of tank. (18) Reinforcements spot-welded to opposite side. (19) Same reinforcements spot-welded to flange of tank. (20) Five holes pierced to attach tank to car frame (21) Double spot-welding of nuts and nut retainers that attach tank to frame. (22) Tank moves by conveyor to water test where six men give it a five-minute test for leaks under 20-pound air pressure. (23) Belt conveyor passes tank before line of four inspectors (24) Four men apply antirust oil to threads of nuts (25) Two men hang tank on conveyor which delivers it to final assembly line where it takes its place in the car. This second series of operations engages 35 men.

The making of a fuel tank requires 27 parts, 55 operations (10 minor motions in additions to those just described), and 93 men. From this it may be seen how many more operations and men are involved in the making and assembly of a complicated part such as a motor or a rear axle. The effect of the process is to make every part not only instantly interchangeable but also of uniform quality, neither of which is possible by

any other process.

As to the effect of mass production on employment, the number of jobs normally established and the number of persons normally employed in proportion to the population has steadily increased from the time machines first came into industrial use. In 1870 the work of 324 persons per 1,000 population was required to supply goods and services; in 1930, with the machine predominant, 400 persons out of every 1,000 were similarly employed. In the meantime, 20 great new industries, entirely impossible without machinery, had sprung into existence. The experience of the Ford Motor Company, with all its expert efficiency in decreasing the number of men required on specific jobs, is that the number of man-hours of labor per car produced has steadily increased.

American business management always has been the focus of two seemingly irreconcilable

demands, that of the consumer for higher quality at lower prices, and that of the employee for a higher wage and a shorter workday. Previous to about 1900, managerial ability was measured by the dexterity with which these two demands could be balanced one against the other. Wages would be reduced or the workday lengthened and the difference used to improve the quality or reduce the selling price of goods, until employee protest made a change of policy advisable; or, on the opposite course, the quality of goods was lowered or the price increased and the difference applied to wages, until consumer protest and loss of trade compelled abandonment of that makeshift About 1900 there appeared on the American scene a more modern and competent type of business management that studied these apparently antagonistic demands and, recognizing both to be just, concluded they were therefore practicable. Thereupon, management developed methods—the beginnings of mass productionthat eliminated waste of time and materials and increased the output, enabling employees to earn a higher wage by more efficient work in fewer hours, and consumers to buy better goods at lower prices With that reform a new era began in American business and it is now nowhere questioned that in the United States the consumer may purchase more value at lower cost and the employee earn a higher wage for less hard labor

than anywhere in the world.

On a superficial view it sometimes seems that mass production methods reduce employment. That may be the result in a given job, but the reverse is true of the total volume of industrial employment. How it works out in practice may be seen by a study of an insignificant item, the inner shell of the hubcap of a motorcar. Made by machinery this article costs 12-and-a-fraction cents. Made by hand at 1929–1938 wage rates, it would cost \$2 50 A machine will produce 2,610 hubcap shells while the handworker is hammer-ing out one To produce by hand the number required for one day's normal output of motorcars would require the employment of about 5,000 men. The uninformed conclusion is that this machine throws 5,000 men out of work. The fact is that had the hubcap shell been made by hand, it would indicate a stage of progress in which everything else pertaining to a motorcar would also be made by hand, and therefore a stage of progress in which neither these 5,000 men nor the other 350,000 men engaged in fabricating automobiles could have been employed in any mass production industry. And the 24 years of employment at \$7 a day that went into the construction of that hubcap-making machine would not have been possible. A handmade Ford car would cost at least \$17,850, and at that price there would be no automotive industry. It was by economies, such as making this hubcap shell by machinery, that a motorcar at a payable price was made available to the general public and an industry established that gave vast direct and indirect employment. Labor economies do not mean unemployment. The typewriting machine invaded a business world that wrote its correspondence and kept its accounts with a pen; instead of reducing office employment, the typewriting machine opened a new profession for tens of thousands who otherwise could not have worked in offices, and in addition employed tens of thousands of mechanics in making typewriters, cash registers, and comptometers. Nor did it :-

jure the pen and pencil business—witness the growing manufacture of fountain pens and pat-

ent pencils.

The stimulating effect of the typewriting machine on what would seem to be its rivals, the pen and pencil, indicates a law of business that even mass production has not altered, namely, that nothing useful is ever superseded When oil came in as an illuminant, some prophesied the disappearance of candles; probably more candles are manufactured today than when they were the main source of artificial lighting When gas came, it seemed to be the end of oil; more oil is produced for more uses today than ever before Then electricity arrived and gas seemed to be doomed, today more gas is manufactured and used for more purposes than in the heyday of the gaslight. By all logic, the stove should have abolished the fireplace, but the fireplace is commoner today in domestic architecture than at any time in half a century. House furnaces should have superseded the stove, but now besides the furnace business and the continued manufacture of coal and wood stoves, there is a flourishing business in oil, gas, and electric stoves. The automobile did not abolish the bicycle; in a recent year more bicycles were made than in any other year of bicycle history, and the industry experienced in 1942 another boom due to wartime conditions. The motorcar outmoded the horse as a means of motive power, which should have spelled the end of the blacksmith shop; but towns that had one or two blacksmith shops now have from four to ten garages New business does not extinguish useful old business, and mass production, instead of destroying old business, has presented it with the means to insure its survival The great mass production industries, with their reliance on tens of thousands of smaller industries as suppliers, have had the effect of increasing rather than diminishing the amount of individual business enterprise in the country.

The effect of mass production on the employee may be stated as follows: it enabled him for the first time to become a consumer of the goods he makes; it prolongs his effective working life by practically eliminating the strain of hard physical labor; it increases his technical skill by its higher requirements of workmanship and by the variety of his experience with technical processes. Contrary to a view assiduously and academically disseminated, mass production requires a high degree of mass skill. In a total of 74,282 employees in one Ford factory, 12,258, or 16.5 per cent, are highly skilled men This percentage of skilled men is much higher than could have been found among the people of the handicraft period. The percentage of semi-skilled men also runs higher under mass production than under the previous system. And unskilled labor is enabled to earn a higher wage than it ever was paid before. The presence of modern machines imparts to the men who manage them some of the skill that went to their making. Every tool enshrines the craft and experience of the men who developed it, and transmits somewhat of these values to those who work with it. It is not accidental, therefore, that in the United States where mass production has reached its widest use, technical skill among the people is more prevalent than in any other country.

The extent to which the mass production technique could be used to arm a nation quickly and effectively was

widely recognized at the advent of World War II, and in the United States the automotive industry was called upon to play a very important part in the war effort A good example of the application of mass production technique to production of war material was the Willow Run bomber plant, 35 miles west of Detroit, where 8,685 four-engine bombers of the B-24 Liberator type were manufactured and assembled. Willow Run's greatest contribution to the war effort was the demonstration that automobile type mass production of airplanes is actually the method best suited for incorporating constant modifications

method best suited for incorporating constant modifications

There had never been any doubt that mass production of airplanes would be less costly in time and manpower, if engineering changes could be frozen. Willow Run, however, proved that engineering changes could be incorporated into new planes faster in a mass-production setup than in the more conventional airplane manufacture. It was also demonstrated that the mass production technique is in fact a very flexible system, this was shown by the elimination of the greater part of modification center work, by incorporating into original production the diverse parts required. Again, this plant demonstrated the close control on quality that the mass production technique permits.

demonstrated the close control on quality that the mass production technique permits.

The future of mass production is definitely determined Automatic machinery will greatly increase in variety and use This, not with the impossible purpose of making human beings observe in industry, but as the result of an inescapable evolution which will enhance economic supply and liberate human brain and brawn to the long overdue cultivation of new and waiting fields. See also Industrial Design.

Edsel Ford.

Revised by Henry Ford II, President, Ford Motor Company

MASSA, mas'sa, or MASSA DI CAR-RARA, town in Tuscany, Italy; capital of the province of Massa e Carrara; on a hill three miles from the Gulf of Genoa, 25 miles north of Pisa and 20 miles southeast of Spezia. It is an episcopal see, has a cathedral, public library, and academy of arts and sciences, and an ancient ducal palace now used as the pre-fectual building The chief industry is the quarrying of the superior white marble in the vicinity; tobacco, silk, cotton, paper, and oil are manufactured. Massa was once the capital of the principality of Massa and later capital of the duchy of the same name, but since 1870 it has been in the state of Tuscany. Pop. 41,800.

MASSACHUSET, mas-a-choo'set, a tribe of North American Indians of the Algonquian stock, formerly living in the neighborhood of Massachusetts Bay, between Salem and Plymouth. Their capital, Massachuset, was where Quincy now stands. A pestilence in 1617 greatly reduced their number and on the arrival of the white settlers the tribe numbered but a fraction of its former hosts, about 500. In 1633 this number was further depleted by the ravages of smallpox. They were placed by the whites in the missions of Natick, Nonantum, and Ponkaron in 1646 and conductive transport in 1646 and cond pog in 1646 and gradually disappeared. See ALGONQUIN; INDIANS.

MASSACHUSETTS, one of the 13 original states of the Union, and the most populous of the New England states. Its greatest length is 184 miles; its greatest breadth, 1134 miles; average breadth, 4734 miles. Capital, Boston. Population (1940) 4,316,721. Its familiar name "The Old Bay State" is due to its location upon Massachusetts Bay, an inlet of the Atlantic Ocean which forms the eastern boundary of the state. It is bounded on the porth by the state. state It is bounded on the north by the states of New Hampshire and Vermont; on the west by the State of New York; on the south by the states of Rhode Island and Connecticut, to-gether with the Atlantic which, skirting the southeastern coast, forms between the outlying islands of Martha's Vineyard and Nantucket, belonging to the state, a broad waterway known

as Nantucket Sound and an inlet called Buzzard's Bay, beyond the eastern extremity of Long Island Sound. The name "Massachusetts" is compounded from Indian words meaning "Great Hills Place," alluding probably to heights of land near the coast in the vicinity of Boston The present State seal, adopted in 1780 in place of other devices previously in use, shows an Indian holding in his right hand a bow and in his left an arrow pointing downward, all of gold, displayed upon a blue shield, and in the upper corner, above the right arm of the Indian, a silver star having five points. The motto, adopted for Massachusetts by the Provincial Congress in 1775, is, in Latin, "Ense petit placidam sub libertate quietem," or in English, "With the sword she seeks quiet peace under liberty."

Topography.— The area of the State comprises 8,257 square miles, 7,907 square miles being land surface, and 350 water. A portion of the Appalachian Mountain system forms two distinct ranges crossing the western part of the State from north to south Of these, the Taconic range on the extreme western border has as its highest elevation Mount Greylock (3,535 feet) in the northwestern corner of the State, which is also the highest elevation found within Massachusetts Thence the range falls to an elevation of 2,624 feet near the southwestern The other or Hoosac range farther east has, as its highest peak, Spruce Hill (2,588 feet), its general height ranging, however, from 1,200 to 1,600 feet. Mount Tom (1,214 feet) and Mount Holyoke (955 feet) are conspicuous elevations rising above the valley of the Connecticut River Mount Wachusett (2,108 feet) and Mount Watatic (1,847 feet) in the north central part of the State are also noteworthy. An elevated plateau, 1,100 feet high at its greatest elevation, forms the central portion of the State and slopes gradually toward the east, the highest point near the coast being the Great Blue Hill of Milton (620 feet). The sandy peninsula or arm of land known as Cape Cod is a distinguishing feature of the topography of the State, enclosing between the bend and the main coast the considerable body of water known as Cape Cod Bay. The arm of the cape is now penetrated by a ship canal shortening the route between the port of Boston and southern waters. The main coast line of the State, some 300 miles in extent, affords excellent harbors, especially at Boston, New Bedford, Gloucester and Salem. See BOUNDARIES

OF THE UNITED STATES

Rivers and Lakes.—The principal rivers are the Connecticut, crossing the State from north to south, approximately 40 miles east from the western boundary; the Housatonic, flowing south, and the Hoosac, north, between the Taconic and Hoosac ranges; and the Merrimac, in the northeastern part of the State, having its source in New Hampshire and flowing into the Atlantic on the eastern coast. These rivers, except the Merrimac for some 15 miles from its mouth, are not navigable for shipping; but together with the Deerfield, Westfield, Chicopee and Miller's River, branches of the Connecticut, the Nashua and Concord, branches of the Merrimac, the Blackstone flowing from the centre of the State southerly across the Rhode Island boundary, and numerous other small streams, afford water power of the highest efficiency

which has been fully utilized in the industrial development of the State and contributed largely to the extension and growth of manufacturing, the chief source of the wealth of its people. The Mystic and Charles rivers, flowing into Boston Harbor, and the Taunton, entering the bay at Fall River, are tidal streams each navigable for a short distance inland. There are numerous small lakes or ponds throughout the State, adding much to the beauty of the landscape, and, in many cases, utilized as sources of water supply for the inhabitants.

Geology.— The rocks are principally metamorphic of the Archæan and Palæozoic systems. In the river valleys and elsewhere there are masses of glacial drift, including sand and boulders, some of the latter being of large size. No mineral deposits of great value exist, except stone for building purposes, limestone and sandstone of the highest quality being quarried in the Connecticut Valley and west of the Connecticut, and granite of several varieties and superior character at Cape Ann, Quincy, and to a lesser extent in other eastern sections elevations of the lower Connecticut Valley are composed of bolerites, feldspathic and calcareous gness. There are extensive Mesozoic sandstone beds and shales in the Connecticut Valley, with small areas of syenite on each side. and an area of gneiss extending easterly from the Connecticut to the central part of the State. Syenite and porphyry are found in the east; feldspathic gneiss and granite in Plymouth and Bristol counties; gness and hornblende schist in Middlesex County; syenite in Essex and Norfolk counties; carboniferous deposits in Bristol and Plymouth counties, and Cambrian, Silurian and Devonian limestones, quartzites, schists and slates west of the Connecticut

Climate and Scenery.— The temperature is variable and, especially in the eastern parts of the State, subject to frequent and wide fluctuations. In the early spring easterly winds prevail upon the coast, which are peculiarly trying to persons of delicate constitution. The winters are moderately severe, although near the sea there is much milder weather, during the winter months, and the fall of snow is not excessive. The summers are frequently marked by periods of excessive heat and sometimes by prolonged drought. The mean average rainfall for the State is about 48 inches. The normal temperature rises above the freezing point at Boston about 7 March and the normal temperature of 60° for the day reaches Boston about 24 May It falls to 60° about 25 September. Observations extending over 25 years show that upon the average experience the warmest week at Boston follows 13 July. On the other hand, the coldest week follows 24 February.

The scenery in the western counties is exceedingly picturesque, notably in the valleys of the Connecticut, Hoosac, Deerfield and Housatonic rivers. Here are found the noted Berkshire Hills. The northeastern coast line extending southerly from Cape Ann is bold and rocky, while the southern and southeastern shores of Cape Cod and Buzzard's Bay are low and sandy. The islands of Martha's Vineyard and Nantucket and the group known as the Elizabeth Islands partake of the characteristics of the neighboring mainland.

History.— The native inhabitants of Massachusetts were Algonquins of various tribes. each having its distinguishing name. The Indian nomenclature of hills, rivers, lakes and local districts is still preserved in many cases. The first fully authenticated visit of a Euroyean explorer is that of Bartholomew Gosnold in 1602, although there are traditional accounts of the visits of others, particularly of Northmen under Lief Erikson, some 600 years earlier, with subsequent settlements maintained during three centuries, of which, however, no undisputed traces exist, although a commemorative tower erected on the Charles near Boston is claimed to mark the site of a Norwegian settlement named Norembega. Gosnold skirted the coast from Salem southward, named Cape Cod and discovered the neighboring islands A settlement made upon one of these was soon abandoned Subsequent attempts at settlement by Prynne (1603) and Waymouth (1605) also failed The Pilgrim Fathers, so-called, a company of English separatists who, seeking religrous freedom, had, under the guidance of their pastor, John Robinson, left England for Leyden in Holland in 1607–08, sailed from Delfthaven in 1620, and soon afterward, 102 in number, from Plymouth, England, in the Mayflower (qv), with the intention of forming a settlement south of the Hudson River Under stress of weather, however, they were forced to land in Provincetown Harbor 11 Nov 1620, and finally upon the mainland at Plymouth 11 December (old style), where a settlement was established under a constitution or compact signed by all before leaving the ship, John Carver being chosen governor for one year Despite much hardship this settlement was never abandoned and formed the basis of the Plymouth Colony.

A settlement made at Cape Ann in 1623 by English fishermen was in 1626 abandoned in favor of a location at Salem. A company of English Puritans under John Endicott, having obtained a grant of land on Massachusetts Bay, icined them in 1629. Under the charter of the company joined them in 1628. Under a charter granted the following year the colony of Massachusetts Bay was firmly established. In 1630 the colony received large accessions under John Winthrop, and the seat of administration was soon trans-ferred, first to Charlestown and finally to Bos-ton These two colonies, Plymouth and Massa-chusetts Bay, advanced side by side, the last named growing in importance by constant accessions, although less tolerant than the former in religious matters. The original government was indeed theocratic, based upon the Congregational form of church government, which was established by law in 1651. A confederacy including the two colonies and that of Connecticut was formed in 1643, followed by one upon

a somewhat broader basis in 1663

In the Massachusetts Bay Colony religious intolerance was frequently exhibited during the early years. Roger Williams and others whose opinions were thought to be dangerous to the

community were banished

Troubles with the Indians, the original inhabitants of the country, involved both colonies, the more important being the Pequot War (1636-37), and the war with King Philip (1675-76). Gradually relations with the mother country became strained. After the restoration of Charles II a royal commission was appointed

to administer the government, but was prevented from exercising its powers by the colo-nial authorities. The English High Court of Chancery in 1684 declared the charter of Massachusetts forfeited, and a succession of governors appointed by the Crown administered the colonial government, generally with much friction engendered by an adverse public opinion Plymouth and Massachusetts Bay colonies were consolidated under a new charter in 1692. The territory of Maine, New Hampshire and Vermont formed part of the original province, separation being progressively accomplished and finally completed by the creation of the independent State of Maine in 1820.

In the colonial wars between France and England, and in difficulties with the Indians prompted by French influence adverse to the English colonies, Massachusetts was largely involved Especially in the French and English wars (1744-48 and 1758), the colony took an important part, contributing in great measure to the success of the expedition against Louisburg and other Canadian campaigns In these military operations, the colonists learned to estimate their strength justly and acquired experience which was of great value in the final struggle which resulted in independence

Measures of taxation devised by the home government and restrictions upon the growing commerce of the colony led to a constantly increasing spirit of resistance and, finally, to riots in Boston (1765-68) against the enforcement of the Stamp Act (q.v) In 1770 three citizens of Boston were shot by British soldiers, part of a garrison quartered upon the town without consent of the people In December 1773 a cargo of tea, subject to a duty disliked by the colonists, was destroyed by being thrown into the harbor of Boston by a company of townspeople disguised as Indians This episode is now widely known as "The Boston Tea Party" (qv.). The port of Boston was closed in retaliation The meeting of the General Court at Boston being postponed indefinitely, its members accomplished to Special 1775. bers assembled at Salem On 19 April 1775 the first blood of the Revolution was shed at Lexington not far from Boston, followed by the fight at Concord Bridge. On 17 June oc-curred the battle of Bunker Hill at Charlestown, which, although counted as a British victory, exhibited the effective strength and stub-born power of resistance of the colonial forces, who, about 1,200 in number, resisted more than 3,000 British regulars, only giving way when after the third assault their ammunition failed. Throughout the war Massachusetts took a prominent part, notwithstanding the emigration of a considerable number of loyalists to the eastern British provinces She provided 67,907 troops and \$820,000 in revenue. At the close of the war, Massachusetts entered the Union, its State constitution being adopted in 1780 and the Constitution of the United States ratified January 1788. In the naval operations incident to the war with England in 1812, the seamen from Massachusetts won especial credit.

The State was closely identified with the anti-slavery movement by the growth within the landers of extensions possible seating the state.

her borders of a strong popular sentiment in favor of abolition William Lloyd Garrison favor of abolition (q v.), Wendell Phillips and many other prominent men were influential in this movement.

In the War of the Rebellion the State furnished 159,165 men to the Union army and navy, paying in bounties and interest on bounty loans more than \$26,000,000, besides large sums in State and military aid. At the close of the war, the war debt of the State approximated \$15,000,000. In the late war with Spain also, the quota from Massachusetts was promptly furnished, the men being among those first in the field. And in the great European conflict the State acted in conformity with its honorable traditions.

Recreation.—In modern days the State has become a great summer playground and also a haven for winter sports. There are over 200 golf courses most of which are open to the public. Tournaments, both for amateurs and professionals, are frequently held during the season. The ocean front of the State extends over a thousand miles and affords ample seabathing facilities although many towns have developed bathing beaches and restrict their use to their own people. The State, however, has eight ocean beaches which it administers through its Department of Conservation. Other ocean beaches are controlled by the Metropolitan District Commission. The Brockton Fair and the Eastern States Exposition are the largest of the 18 or 20 annual fairs held all over the State. The annual attendance at these fairs is over 600,000. Winter sport facilities are provided in the many State forests and reservations. The Berkshire Hills is well developed as a skiing center and of late years the Wachusett section has come into prominence. Skating, tobogganing and snowshoeing are sports common in winter in all sections of the State. The Appalachian Trail crosses the State from south to north, from Connecticut to Vermont and in the several reservations there are several less known trails. Hunting and fishing are other sports which have great numbers of devotees. Hunting is limited in the State forests requiring a special permit, if permitted at all.

Population.—On 1 April 1940 Massachusetts had a population of 4,316,721, an increase of 67,107, or 1 6 per cent over its 1930 population of 4,249,614. The first census of Massachusetts was taken in 1790 and returned a population of 378,787. The population has increased with every census since that time, passing 1,000,000 between 1850 and 1860, 2,000,000 between 1880 and 1890, 3,000,000 between 1900 and 1910, and 4,000,000 between 1920 and 1930. The 1940 population represents a density of 545.9 inhabitants per square mile. Eight of the 14 counties gained in population between 1930 and 1940, Barnstable County, with an increase of 15.4 per cent, having had the most rapid growth. The following table shows the population of Massachusetts broken down into urban, rural,

male, female, white, and nonwhite.

Population of Massachusetts, 1930-1940

	1930	1940
Massachusetts Urban Rural Male Female White	3,831,426 418,188 2,071,672 2,177,942 4,192,992	4,316,721 3,859,476 457,245 2,102,790 2,213,931 4,257,352
Nonwhite	56,622	59,369

Counties.—The population of the 14 counties in the State in 1930 and 1940 was as follows:

Counties:	1940	1930
Barnstable		32,305
Berkshire		120,700
Bristol		364,590
Dukes		4,953
Essex		498,040
Franklin		49,612
Hampden		335,496
Hampshire		72,801
Middlesex		934,924
Nantucket		3,678
Norfolk		299,426
Plymouth		162,311
Suffolk	863,248	879,536
Worcester	504,470	491,242

Between 1930 and 1940 Massachusetts rural areas grew faster than the urban places, according to the figures of the 16th Decennial Census This period thus reversed a trend toward greater concentration of population in urban areas, which lasted from at least 1790 to 1930. There were 39 cities of 10,000 or more in the State and there were also 39 towns in this size group in 1940. Lexington, Marblehead, Northbridge and Reading were added to this group during the decade. Fifty of these 78 urban places of 10,000 or more increased between 1930 and 1940. Despite the fact that the rural population increased in the 1930-40 decade, the character of the people remains essentially urban. The 39 cities and the 316 towns take up the entire area of the State. Many towns have adopted representative city government, others have the limited form of town meeting to which delegates are chosen by precinct to obviate the confusion that would ensue in the larger and more densely populated towns, the remainder have the traditional town meeting form of government in which selectmen are chosen as well as other administrative officers Politically there has always been a wide di-vergence between rural population and the metropolis. The distrust of the political power of the great metropolis is shown by the fact that its commissioner of police is appointed by the governor of the State and not by the mayor.

Incorporated Cities.—The table (page 403) shows the cities of the State, arranged with the population, from the censuses of 1920 and 1930 and the Federal census of 1940. Boston, the capital, is the chief city of the Commonwealth and in the census of 1940 ranked ninth among the great cities of the Union. Identified with the growth of the State from its beginning its historical landmarks are of profound interest to the visitor, and the traditions of the city, its development in modern times, its unrivaled suburbs distinguished by large numbers of tasteful and well-kept residences, its beautiful parks, public buildings and points of literary and artistic interest, give it an important and in many respects a unique place among American cities. Other cities closely connected with the early history of the Commonwealth are Salem and Newburyport, located on the eastern coast in Essex County. Cambridge, near Boston, with which it is connected by several bridges spanning the Charles River, is the seat of Harvard University, and the former home of Longfellow and Lowell Lowell and Lawrence upon the Merrimack, Fall River and New Bedford in Bristol County, and Holyoke in Hampden County, are all extensively engaged in textile manufacturing. Holyoke also, with Springfield, is especially inter-

IV22VCI IOAFII	•		10141 1 0	
nington, (L4) 1,454		Falmouth, (M6) 1,788	Lakeville, □ (L5) 1,780	Nantasket Beach,
ping(dil. (L4) 275	Chester, □ (C3) 1,284	Farnams, (B2) 190	Lancaster, ☐ (H3) 2,963	(L3) 1,09
mayer (KI)	Chesterfield (C3) 422	Farnumsville, (H4) 878	Lanesboro, □ (A2) 1,321	Nantucket, (07) 2,47
ton (13)	Chicopce, (D4) 41,664	Fayville, (H3) 327 Feeding Hills, (D4) 1,443	Lanesville, (M2) 1,780	Natick. (J3) 13,85
	Chicopee I alls, (D4) 12,155	Fisherville, (H4) 1,443	Lawrence, (K2) 84,323 Lec, (B3) 1,510	Needham, (K3) 8,31 Needham Heights,
	Chilmark, (M7) 226	Fishdale, (F4) 537	Leeds, (D3)	(B7) 3,000
mwam (D4)	Chiltonville, (M5)	Fitchburg, (G2) 41,824	Locuster, (G4) 4,851	Neponset, (D7)
	City Mills, (J4) 290	Florence, (D3)	Lenox, (A3) 1,275	New Bedford, 1
mesout (F.31 3,497	Clifton, (E6) 2,920	Forest Hills, (C7)	Lenox Dale, (B3) 562	(K6) 110,34
Anter (NZ) 11,144	Clinton, (H3) 11,810	Forest River, (E6)	Leominster (G2) 22,226	New Boston, (B4) 137
miciniam (1/12) 437	Cochituate (J3) 952		Leverett, (E3) 688	New Braintree,□
tweeton (CO) 40,040	Coldbrook Spr. (C3)	Foxboro, (J4) 2,284	Lexington, (J3) 13,187	(F3) 430
hburnham (1002) 4,437	Coldbrook Sprs (G3) Collinsville (J2) 689	Framingham, (J3) 23,214 Framingham Center,	Leyden, ☐ (D2) 260 Lincoln, ☐ (J3) 1,783	New Braintree Station, (F3)
	Colrain, (D2) 1,497	_(J3) 1,400	Linwood, (H4) 854	Newbury, □ (L1) . 1,590
milcio, _ , _ , _ , _ , _ , _ , _ , _ , _ , _	Concord, (J3) 1,779	Franklin, (J4) 4,725		Newburyport, @
hland (J3) hley I alls, (A4) 367	Conway, \square (D2) 994	Furnacc, (F3) 69	Littleton Common,	(L1) 13,916
eminol. (L4) 200	Cordaville, (H3) 220	Gardner, (G2) . 20,206	(J2)	New Lenos, (B3)
sonet (K5)	Cotuit, (N6) 609	Gay Head, □ (L7) 127		New Marlboro,□
hol, (1-2)	Cummaquid, (N6) 170	Georgetown, (L2) 1,803	Lowell, (J2) 101,389	(B4) 95(
tleboro, (J5) 22,071	Cummington, (C3) 608	Gilbertville, (F3) 1,023 Gill, □ (D2) 931	Ludlow. ☐ (E4) 8,181 Ludlow Center, (E4)	New Salem, ☐ (E2) 357 Newton, (K3) 69,873
tleboro Falls, (J5) 1,073 burn (G4) 6,629	Cushing, (L1) Cushman, (D3)	Gleasondale, (J3) 500	Lunenburg, (H2) 2,195	Newton Center, (C7)
burn, (G4) 6,629 burndale, (J3)	Cuttyhunk, (L7) 71	Glendale, (A3) . 294		Newton Highlands,
pg (K4) 745	Dalton, (B3) 3,018	Gloucester, (M2) 24,046	Lynn, (L3) 98,123	(C7)
on, (K4) 745 er, (H2) 2,347	Danvers, □ (L2) 14,179	Goshen, □ (C3) 237	Lynnfield, (L2) 2,287 Lynnfield Center,	Newton Lower
dwinsville (12) 1,240	Danversport, (L5)	Grafton, ☐ (H4) 7,457	Lynnfield Center,	Falls, (B7)
liard Vale, (K2) 804	Dartmouth, (K6) . 9,011	Granby, (E3) 1,085	(C5)	Newton Upper
mstable, (N6) 574	Dedham, (K4) 15,508 Deerfield, (D2) 522	Graniteville, (J2) 907 Granville, □ (C4) 668	Magnolia, (M2) 910 Malden, (K3) 58,010	Falls, (C7) Newtonville, (C7)
rre, (F3) 1,115 rre Plains, (F3) 231	Deerfield, (D2) 522 Dennis,[] (O5) 2,015	Great Barrington,	Manchaug, (G4) 867	Nonquitt, (L6)
rrowsville, (K5) 556	Dennis Port, (O6) 753	(A4) 2,774		Norfolk, (J4) 2,294
cket, □ (B3) 689	Dighton, (K5) 841	Greenbush, (M4) 288	Manomet (M5) 486	N Abington, (L4) 2,044
dford, (J3) 1 306	Dodge, (G4) 100	Greenfield, (D2) 12,472	Mansfield, (J4) 4,312	N Acton, $(J2)$ 675
echwood, (L4) 505	Dodgeville, (K5) 693	Green Harbor, (M4) 143	Marblehead, (L2) 7,100	N Adams, (B2) 22,213
Ichertown, (L3) 3,503	Dorchester, (D7)	Greenwood, (D6)		N Amherst, (E3) 885
lingham, (J4) 2,979	Douglas, (IH4) 2,617	Griswoldville, (D2).		Northampton, 24.704
mont, (C6) 25,158	Dover, □ (J4) 1,374 Dracut, (J2) 3,801	Groton, (H2) 1,019 Groveland, □ (L1) 2,122	Marshtield, ☐ (M4) 2,419 Marshfield Hills,	(E3) 24,794 N Andover, (K2) 5,335
rkley, □ (K5) 1,130 rlin, □ (H3) 1,057	Dudley, (G4) 4,616	Groveland, \square (L1) 2,122 Hadley, \square (D3) 2,576		N Attleboro, (J5) 4,971
mardston, (D2) 954	Dracut, (J2) 3,801 Dudley,□ (G4) 4,616 Dunstable,□ (J2) 447	Halıfax,□ (L5) 867		N Bellingham, (J4) 578
verly, (L2) 25,537	Duxbu₁y, □ (M4) 2,359	Hamilton, ☐ (L2) 2,037	Mashpee, ☐ (M6) 434	N Billerica, (J2) 1,571
verly Farms, (L2)	E Blackstone, (H4) 891	Hampden, ☐ (E4) 1,023	Mattapan, (C7)	Northboro, □ (H3) 2,382
lerica. (12) 7.933	E Braintree, (L4) 3,181	Hancock, (A2) 332		N Brewster, (O5) 183
sckinton, (B2) 980	E Brewster, (OS) 170 E Bridgewater, (L4) 1,149 E Brookfield,□(G4) 1,016 E Dedham, (K4) 4,156 E Dennis, (OS) 175	Hanover, □ (L4) . 2,875		Northbridge,☐ (H4) 10,242
ackstone, (F14) 2,351	E Bridgewater, (L4) 1,149	Hanson, (L4) 567 Hardwick, □ (F3) 2,154	Medfield (J4) 774	(H4) 10,242 N Brookfield, (F3) 2,402
indford, ☐ (C4) 479 Iton, ☐ (H3) 775	E Brookfield, □(G4) 1,016 E Dedham, (K4) 4,156	Hartsville, (B4) . 143	Medfield Jc , (B8) Medford, (K3) 63,083	N Carver, (L5) 284
ndsville, (E4) 1,080	E Dennis, (O5) 175	Harvard, ☐ (H2) 1,790	Medway, (14) 1,242	N Chatham, (O6)
STON, (K3) 770,816	E Douglas, (G4) 1,804 E Falmouth, (M6) 695	Harwich, □ (O6) 2,535	Melrose, (K3) 25,333	N Chelmsford, (J2) 1,765
urne, □ (M6) 3,315	E Falmouth, (M6) 695	Harwich Port, (O6) 522	Melrose Highlands,	N Cohasset, (L3) 375
urnedale, (M5)	L Foxboro, (K4)	Hatfield, (D3) 1,564	(D6)	N Dartmouth, (K6)1,936
¥ford, ☐ (K2) 778	E Freetown, (L5). 250	Haverhill, (K1) 46,752		N Dighton, (K5) 1,181 N Eastham, (O5) 188
ylston Center, H3)	Eastham, □ (O5) 582 Easthampton, (D3) 8,409	Haydenville, (C3) Heath, □ (C2) 359	Merrimacport, (L1)	N Easton, (K4) 1,895
aintrec, □ (K4) 16,378	E Harwich, (O6) 220	Hebronville, (J5). 471		N Egremont, (A4) 200
ant Rock, (M4) 1,060	East Lec, (B3) 179	Hingham, □ (L4) 8,003	Middleboro, (L5) 5,072	N Falmouth, (M6) 579
wster, □ (O5) 827	E Longmeadow,	Hingham Center,		Northfield, ☐ (E2). 1,975
idgewater, (K5) 1,757	(E4) 2,411	(E8) 690		Northfield Farms,
infield, (I 4) 1,012	E Mattapoisett,	Hinsdale (B3) 828	Milford, (H4) 11,841	(E2) N Grafton, (H4) 1,062
nekton, (K4) 62,343	(M6)	Holbrook, (L4) 1,285 Holden, ☐ (G3) 3,924	Millbrook, (M4) 85 Millbur <u>y</u> , (H4) 2,062	N Grafton, (H4) 1,062 North Hadley, (D3)
pokfield, (f 4) 943 poklinc, ☐ (K3) 49,786	East Milton, (D7). East Northfield, (E2)	Holland, (F4) 247	Millers Falls, (E2) 1,313	N Hanover, (L4) 495
bokville, (K4) 914	E Norton, (K5) 500	Holliston, (J4) 1,264		N Harwich, (O6)
pantville, (L4) 490	Laston, (K4) 5,135	Holyoke, (D4) 53,750	Millis, □ (J4) 2,278	N Hatfield, (D3)
ekland, □ (C2) 1,527	Eastondale, (K4) 280	Hoosac Tunnel,(C2) 116		N Leominster, (G2)
rlington, □ (K2) 2,275	L Orleans, (P5) 350	Hopedale, (H4) 1,793 Hopkinton, (J4) 1,540		N Marshfield,(M4). 186 N Middleboro, (L5) 493
zards Bay, (M5) 993	E Otis, (B4) 90	Hopkinton, (J4) 1,540		N Oxford, (G4) .1,157
field, (L1) 378 nhridge, ⊚(K3) 110,879	E Pembroke, (M4) 190 E Pepperell, (H2) 1,694	Hortonville, (K5) Housatonic, (A3) 1,061	Monroe, □ (C2) 207	N Pembroke, (M4) 327
nton, (K4) 2,309	E Pepperell, (H2) 1,694 E Sandwich, (N6) 500		Monson. (C4) 3.391	N Plymouth, (L5) 2,500
nton Jc , (C8) 462	E Saugus, (D6)	Hubbardston Sta-	Montague, ☐ (E2) 7,582	N Reading, □(K2) 2,886 N Rutland, (G3)
disle, [J2) 747	E Saugus, (D6) E Taunton, (K5) 1,330 E Templeton, (G2) 784	tion, (F2)	Montague City (D2)	N Rutland, (G3)
tver. □ (M5) 1,469	E Templeton, (G2) 784	tion, (F2) Hudson, (H3) 7,190		N Scituate, (L4) 669
ryville, (J4) 240	East Village, (G4)	Hull, (L3) . 1,306	Montvale, (Co) . Montville, (B4) 53	N Swansea, (K5). N Truro, (O4) . 500
aumet, (M6)	E Walpole, (K4) 1,601	Humarock, (M4) . 180	Monument Beach,	N Uxbridge, (H4) 1,012
terville (N6). 522	E Wareham, (M5) 708	Huntington, ☐ (C4) .1,340 Hyannis, (N6) 3,392	(M6) . 329	N Westport, (K6) 1,020
stral Village, (K6) 615 Flemont [1] (C2) 789	E Weymouth, (L4) 5,530 E Whately, (D3)	Hyannis Port. (N6). 391	Moores Corner, (E2)	N Weymouth,(D8) 4,220
#lemont [] (C2) 789 #lton [] (F4) 2,557	Edgartown, (M7) 856	Hyde Park. (C7)	Mount Hermon	N Wilbraham (E4) 755
irlton City, (F4) 1,067	Egypt, (M4) 300	Indian Orchard,(E4)	(D2) , 837 Mt Hope, (C7) , .	Norton, ☐ (K5) 3,107 Norwell, ☐ (L4) 1,871 Norwood, (K4)12,039
witton Depot, (F4) 285	Elmwood, (L4) . 325	Interlaken, (A3)	Mt Hope, (C/).	Norwell, (L4) 1,871
irtley, (K5) 487	Erving, (E2) 1,328	Ipswich, (L2) 5,070 Islington, (C8) 687	Manne Washing	Norwood, (K4) 12,039 Oak Bluffs, (M7) . 1,279
tham, (P6) 1,166	Erving, (E2) 1,328 Essex, □ (L2) 1,384 Everett, (K3) 46,784	Islington, (C8) . 687	ton. (A4) 57	Oak Bluffs, (M7) . 1,279 Oakdale, (G3)
#meford [] (12) 0 077	Everett, (N.) . 40,/84	Lefferson. (G3) 1.079	Myricks, (K5).	Oakham, □ (1·3) 423
sea. (K3) 41 250	Fairview. (D4)	Kendal Green, (B6)	Nabnasset, (J2) 284	Ocean Bluff, (M4) . 120
rry Valley, (G3) 1.007	Essex. □ (L2) 1,384 Everett, (K3) . 46,784 Fairhaven. □ (L6) 10,938 Fairview, (D4) . Fall River. ● (K6)115,428	Kingston, □ (M5) .2,783	Nahant, (L3) 1,835	Onset, (M6) 1,287
County scat	□ Populat	tion of Township		
W COLINEV SPAR				

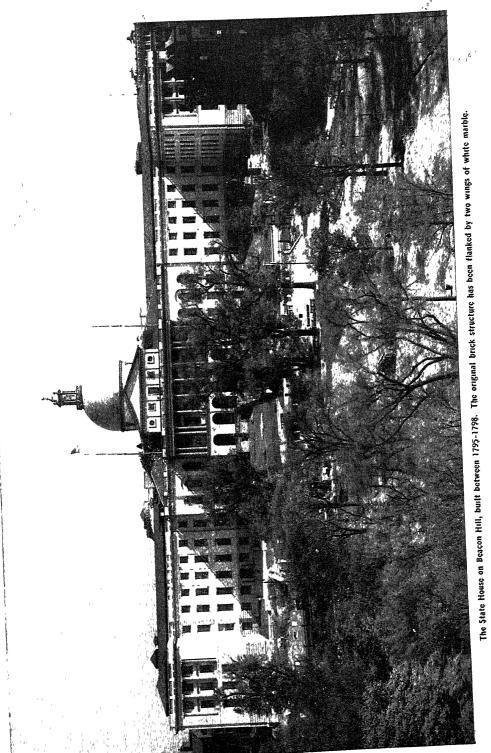
Total Population 4,316,721

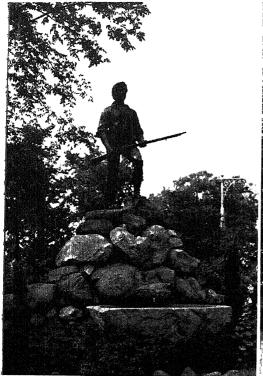
n C (1) (5)	Sagamore, (M5) 938	S Lawrence, (K2)	Uxhiidge, [] (H4) 6,417	W. Mansheld, (K5), 186
Orange, (E2) 4 093	Salem @ (L2) 41,213	South Lee, (A3) 186	Vineyard Haven,	W Median III. no. 1
Or ean _ (P5) 1,451	Salispury □ (L1) 2,376	S Lincoln, (J3) 1800	(M7) 1,421 Wahan, (B7)	W 11.1000 G.M. will a
()-terville (\6) 841	Sandwich (N5) 748	S Middleton, (D5) S Natick, (J3) 931	Wakehold [] (K2) 16 223	Westminster T.G2: 2,126 Westminster Sta-
()t,c='(B4) 104	Santuit, (N6) 100 Saugus, 7 (L3) 14,825	S Natick, (J3) 931 S Orleans, (O5) 225	Wales, □ (F4) 367	tion. (G2)
Otter River (G2) 480	Saugus, J. (L3) 14,825 Saundersville, (G4) 427	So Royalston, (F2) 437	Walpole, (K4) 1,815	W Newbury Milliage
Oxford (G4) 1 601 Palmer (E4) 3,600	Savoy 2 (B2) 300	S Sandistield, (B4)	Waltham, (J3) 40,020	west newton, (C7)
Palmer, (F4) 3,600 Payton 2 (G3) 791	Saxonville, (J3) 1,127	S Sudbury, (13) 489	Waquoit, (M6)	W uston, (13) 635
Pcahody, (L2) 21 711	Scituate, (M4) 919	S Vernon, (D2) 260	Ward Hill, (K2) Ware, (E3) 6 065	W Peanody, IDS.
Pembroke, 1, L4; 1,718	Scotland, (L5)	Southville, (H3) S. Walpole, (K4) 600	Ware, (£3) 6 065 Wareham, (£5) 581	W Pittsheld, (A3) Westport, (A6) 4134
Pembrokc, 1 (L4) 1,718 Pepperell 2 (142) 3 114	Seekonk, (15) 595	S Walpole, (K4) 600 S Wareham, (L5) 450	Warren (F4) 1,482	Westport Point.
D. town home [119.5] U/.5	Segreganset, (K5) Sharon (K4) 1,599	S Wellflect, (P5) 145	Warwick, □ (F2) 444	(K6)
Philipston, 721 481	Sharon (K4) 1,599 Shattuckville, (D2)	S Westport (K6) 559	Washington, [1 (B3) 267	W Rutland, ([3]
Phillipston Sta (F2) Pigeon Cove (\12) 949	Sheffield, (A4) 609	S Weymouth, (1.4) 2,721	Watertown, 🗆	W Springfield [
Pitrstield @ (\3) 49,684	Shelburne Falls, (D2)1,667	Southwick (C4) 1,579	(C6) 35,427 Waterville. (F2) 643	(D4) W Stock bridge - 17,138
Plainticld, (C2) 264	Sheldonville, (J4) 150	S Worthington (C3) 5 Yarmouth (O6) 525	Waterville, (F2) 643 Waverley, (B6)	/ 1 2)
Plainticld, (C2) 264 Plaintille (J4) 1,302	Sherborn, □ (J4) 1,022	5 Yarmouth, (O6) 525 Spencer, (F3) 5 100	Wayland, □ (J3) 3,505	W Tisbury (\17) 260
Pleasant Lake, (O6) 60	Shirley, (H2) 2,608	Springfield, (D4)149,554	Webster, (G4) 10,365	W Townsend, (H2) 580
Plymouth @ (M5) 9,815	Shirley Center, (H2) Shrewsbury, (H3) 1,153	State Farm, (L5) 450	Weliesley, ☐ (J3) 15,127	West Upton (H4) 601
Plympton, (L5) 532 Pricosset. (M6) 428		State Line, (A3)	Wellesley Hills,(B7) 3,500	W Wareham (L5) 640
Pocasset, (M6) 428 Pottersville, (K6)	Siaconset, (P7)	Sterling, □ (G3) 1 713	Wellfleet (O5) 890	W Warren, ([4) 916
Prides Crossing. (E5)	Silver Lake, (L5) 85	Still River, (H3) 360	Wendell, ☐ (E2) 391 Wendell Depot, (E2)	Westwood, (J4) 848 W Yarmouth, (\6) 772
Princeton, □ (G3) 713		Stockbridge, (A3) 1,815	Wenham (L2) 1,220	W 1 armouth, (\61 772) Weymouth, □ (L4) 23,868
Princeton Depot,	Somerville (K3) 102,177 S Acton. (I3) 726	Stoneham, ☐ (K3) 10,765 Stoughton, (K4) 4,252	W Acton, (H3) 883	Whately, [] (D) 979
(G3) 40		Stow, □ (H3) 1,243	W Auburn, (G4) 689	Wheelwright, (F3) 400 #
Provincetown (O4) 3,551 Quincy (K4) 75,810		Straits Pond, (F7) 41	W Barnstable (N6) 556	Whitinsville, (H4) 5,068
Quissett, (M6)	S Ashburnham (G2) 877	Sturbridge, (F4) 1,063	W Berlin, (H3) 200	Whitman, (L4) 4,133
Randolph (K4) 2,955	S Athol, (F2)	Sudbury, □ (J3) 1,754	Westhoro, (H3) 2,864 W Boxford, (K2)	Wilbraham, ☐ (E4) 3,041 7 Wilkinsonville (G4) 564
Raynham (K5) 2,141	S Attleboro, (J5) 2,650	Sunderland, ☐ (D3) 1,085 Sutton, ☐ (G4) 2,749	W Boylston, (G3) 827	Wilkinsonville (G4) 564 Williamsbury
Raynham Center,	S Barre, (F3) 1,237 S Berlin, (H3) 169	Sutton, ☐ (G4) 2,749 Swampscott, (L3) 10,482	W Brewster, (O5)	(C3) 1,684
(K5) 1,362 Reading □ (K2) 10,860		Swansea, □ (K5) 4,684	W Bridgewater,	Williamstown, (B2) 1,7%
Reading (K2) 10,860 Readville, (C8)	S Braintree, (K4) 6,100		(K4) 697	Williamstown Sta-
Rehoboth, (K5) 2,736	Southbridge.	(K5)	W Brookfield, □(Γ4)1,387	tion, (B2)
Revere, (L3) . 34,405	(G4) 16,825	Taunton, (K5) 37,395 Teaticket. (M6) 469	W Chatham, (O6) 185 W Chelmsford, (J2) 900	Willmansett, (D4) Wilmington, ☐ (K2) 4,645
Richmond. □ (A3) 624		Teaticket, (M6) 409 Templeton, (F2) 639	W Chesterfield, (C3)	Winchendon, (F2) 3,454
Richmond Furnace,	S Chatham, (O6) 270 S Dartmouth, (L6) 1,272	Tewksbury, □ (K2) 6,261	W Concord, (J3) 3,250	Winchendon
(A3)	S Deerfield, (D3) 977	Thorndike, (E4) 1,167	W Cummington,	Springs, (G2) 700
Riverside, (C7) Riverside, (D2)	S Dennis, (O6) 200	Three Rivers, (E4) 2,595	(B3)	Winchester, (C6) 15,081
Rochdale, (G4) 936	5 S Duxbury, (M4) 279	Folland, □ (B4) 129	W Dennis (O6) 600	Windsor, ☐ (B2) 314 M Winthrop, ☐ (L3) 16,768
Rochester, ☐ (L6) 1,26	9 S Easton, (K4) 800	Topsfield, ☐ (L2) 1,150 Townsend, (H2) 2,065	West Dudley, (F4) W Falmouth, (M6) 400	Winthrop, □ (L3) 16,768 Woburn, (K3) 19,751
Rock (L5)	S Egremont, (A4) 329	Townsend, (H2) 2,065 Townsend Harbor,	Westfield, (D4) 18,793	Woods Hole, (M6) 549
Rockland (L4) 4,38			Westford, □ (J2) 3,830	Woodville, (H4)
Rockport, (M2) 3,55 Rockville, (14) 14		Truro, □ (O5) 585	Westford Station,	Worcester, (H3) 193,694
Rockville, (J4) 14 Rowe, (C2) 23		Tully, (E2)	W(J2)	Woronoco, (C4)
Rowley, (L2) 1,01	2 S Hadley Falls (D4)2,930	Turners Falls, (D2) 4,881	W Granville, (C4) W Groton, (H2) 382	Worthington, ☐ (C3) 471 Wrentham, (J4) 1,147
Roxhury, (C7)_	S Hanover, (L4) . 492	Tyngsboro, \sqcup (J2) 1,034	W Groton, (H2) 382 Westhampton, □(C3) 403	Yarmouth, □ (O6) 2,286
Royalston, ☐ (F2) 79	5 S Harwich, (O6) 141 2 S Hingham, (E8) 545		W Hanover, (L4) 626	Yarmouth Port,
Russell, □ (C4) 1,24		011101111111111111111111111111111111111	W. Hawley, (C2) 241	(N6) 575
Rutland, ☐ (G3) 2,18	Donor	lation of Township.		
County seat	□ Рори	izeion or rownsings		- 1

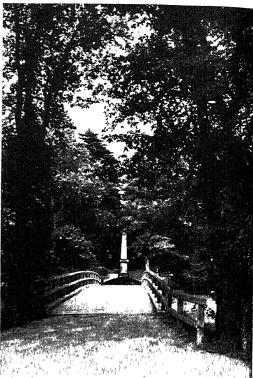
RHODE ISLAND

Total Population 713,346

RHODE ISLAND				10	otai i	opulation 713	,570
Adamsville; (K6) 219 Albion, (J5) 768 Allenton, (H6) 857 Alton, (G7) 105 Anthony, (H6) 2,758 Arcadia, (H6) 77 Arctic (J6) 47 Armold Mills (J5) 47 Annold Mills (J5) 48 Barringtun, (J6) 2,364 Block Island, (H8) 835 Bradford, (H7) 822 Bristol, (H7) 822 Bristol, (J6) 9,767 Canonchet, (H7) 384 Centerdale, (H5) 1,847 Central Falls (J5) 25,248 Charlestown, □ (H7) 1,199 Chepachet, (H5) 677	Cranston, (J5) Crompton, (J6) Davisville, (H6) East Greenwich, (H6) East Providence, (J5) Esmond, (H5) Farmingdale, (H5) Fiskeville, (H6) Foster Center, (H5) Glendale, (H5) Greenville, (H5) Greenville, (H5) Hamilton, (J6) Harmony, (H5) Harrivville, (H5) Harrivville, (H5) Harmony, (H5) Harrivville, (H5) Harligrove, (J6) Homestead, (J6)	5 Howard, (J5) Jamestown, □ (J6) Kenyon, (H7) Kengston, (J7) 2 La Fayette, (H6) Little Compton, □ 6 (K6) 3 Lonsdale, (J5) 0 Lymansville, (J5) Manton, (J5) 7 Mapleville, (H5) 8 Middletown, □ (J6) 6 Narragansett, (J7) 8 Nasonville, (H6) 9 Natick, (H6) 10 Natick, (H6) 11 Newport, (H6) 12 Norwood, (J6) 13 Nasonville, (H5) 14 N Tiverton, (K6) 15 Oakland Beach, (J6) 16 Oak Lawn, (H5) 17 Oakland Beach, (J6) 18 Oak Lawn, (H5)	1,123 530 4,494 30,532 1,206 1,893	Phillipsdale, (J5) Pontiac, (J6) Portsmouth, (J6) Potter Hill, (G7) PROVIDENCE,	1,722 676 1,300 3,683 887 253,504 3,000 263 712 308 2,490 498 117 1,276 205	Corners, (K6) Usquepauch, (H6) Valley Falls, (J5) Wakchold (H7). Warren, (J6) Warwick, (J6) Washington, (H6) Watch Hill, (G7) Weckapaug, (G7) West Barrington, (J5) West Croy, (G7) Westerly, (G7) West Greenwich, (H6) West Kingston, (H7) Wick ford, (J6) Wood River Junction, (H7) Woonsocket, (J4)	5,018 153, 5,417, 7,672, 22,677, 7,672, 853, 7,312 207, 526, 884, 1,139, 471,

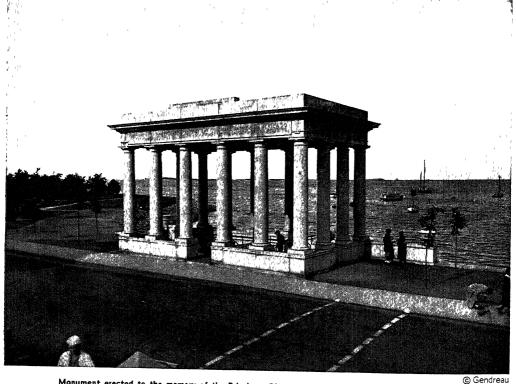






"The Minute Man" statue, Lexington.

Concord Bridge, Concord.

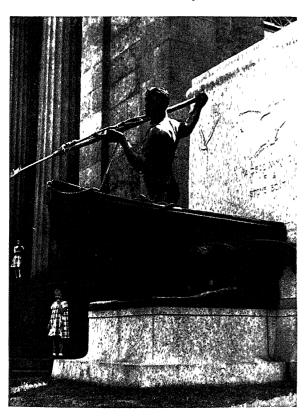


Monument erected to the memory of the Pilgrims Plymouth Rock is contained in the monument

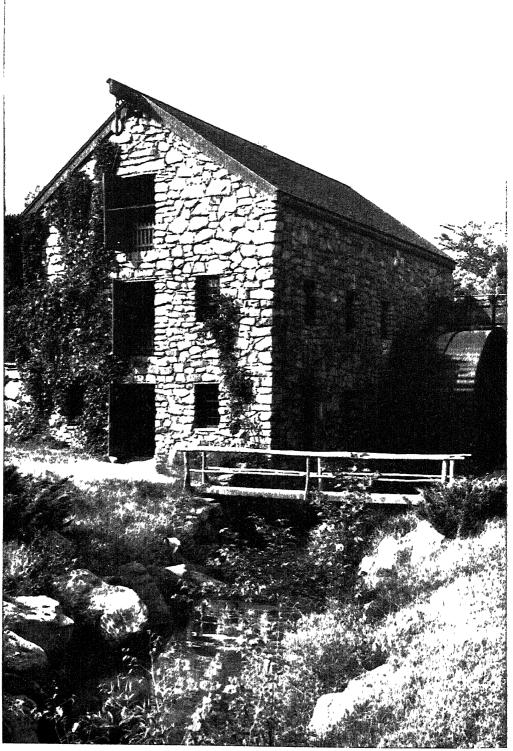


Fishing boats at the docks in Gloucester, Mass.

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Whaler's Monument, New Bedford, Mass.



Old gristmill on the Boston Post Road, near Sudbury, Mass.

		Population	
NAMES OF CITIES	1940	1930	1920
Boston Worcester Fall River New Bedford Cambridge Lowell Springfield Lynn Lawrence Somerville Brockton Holyoke Haverhill Malden Chelsea Newton Quincy Fitchburg Pittsfield Everett Salem Taunton Medford Waltham Chicopee Revere Gloucester Beverly North Adams Northampton Peabody Attleborough Leominster Melrose Woburn Newburyport Marlborough Methuen	770,816 103,604 115,428 110,379 101,389 110,879 110,879 19,554 98,123 84,323 102,177 62,243 84,323 102,177 62,243 84,750 46,752 58,010 41,259 69,873 37,395 63,083 40,020 41,664 34,105 25,737 22,213 24,791 21,22071 22,226 25,333 19,751 13,916	781,188 195,311 115,274 112,597 110,234 100,234 149,900 102,320 85,068 15,068 15,276 48,710 58,036 45,276 48,710 58,036 40,692 49,424 43,353 50,747 43,434 50,747 5	748,060 179,754 120,485 121,217 112,759 129,148 94,2701 66,254 60,254 40,184 47,876 41,763 42,512 37,133 30,915 36,824 22,561 19,572 22,282 19,731 16,746 16,574 15,618

ested in the production of paper of all grades. New Bedford was formerly the seat of the whaling industry now almost entircly abandoned. Lynn and Haverhill in Essex County and Brockton, in Plymouth, are the centres of the boot and shoe industry. Worcester, the second city in point of size, well located near the centre of the State, is an educational cen-tre as well, the seat of Clark University and Holy Cross College, and is largely interested in high-class metal industries and the manufacture of machinery. Waltham, in Middlesex County, is the site of a large watchmaking establishment and has extensive textile factories. Northampton, in Hampshire, is the seat of Smith College for women. Woburn, in Middlesex, has large establishments for the production of leather. Gloucester, a scaport upon Cape Ann, is largely engaged in the fisheries. Quincy, in Norfolk County near Boston, has noted granite quarries. Fitchburg in Worcester County, Taunton in Bristol, North Adams and Pittsfield in Berkshire, Chicopee in Hampden, Beverly in Essex, and Marlborough in Middlesex, are all thriving cities with important industries; and Chelsea and Revere in Suffolk County, Everett, Somerville, Newton, Melrose, Medford and Malden in Middlesex, are rapidly growing municipalities, largely residential and closely connected with Boston within the metropolitan district. district.

Religion.—Originally, as elsewhere stated, Orthodox Congregationalism was the form of Church polity recognized by law. To-day all the principal denominations are represented. In respect to population, the Roman Catholics lead

all others, more than 1,709,174 persons in the Commonwealth being of that faith. In church membership, the Orthodox Congregationalists rank next to the Roman Catholics, with approximately 159,252 members; followed by the Baptists (of whom there are several different bodies), with about 70,000; the Methodists (of different bodies), with about 60,000; the Unitarians, about 35,000; the Protestant Episcopalians, 30,000; and many other lesser bodies, of whom few, if any, exceed the limit of 10,000 in membership. These figures must all be regarded as below the actual, although relatively garded as below the actual, although relatively the bodies stand as stated. In the value of church property, although recent exact statistics are not available, and conclusions must therefore be based upon estimates, the rank of the several denominations is the same except that possibly the Roman Catholics change place with the

Orthodox Congregationalists.

Government.—Originally based upon church membership, the conditions surrounding the suffrage have been subject to successive modifications. Dissenters from the Established Church were released from paying taxes for church purposes in 1815, and in 1833 all denominations were given equal standing before the law. Since the adoption of the original State constitution (1780) it has been three times revised by constitutional conventions held in 1820, 1853, and 1917-19. Numerous amendments to the original articles have been made and new articles adopted from time to time. Every citizen 21 years of age and upward, able to read and write in the English language, except paupers, imbeciles or convicts is entitled to vote The State legislature, called the General Court, consists of the senate, 40 members, and the double of representatives, 240 members, elected in senatorial and representative districts respectively. Biennial sessions are held beginning on the first Wednesday of January and continuing until prorogation after the completion of the business of the session. One of the most important articles in the 1917-19 revised Constitution provides for legislation subject to popular initiative and referendum, so that a specified number of voters bypetition may initiate constitutional amendments and laws, or may require laws enacted by the General Court to be referred to the people for ratification or rejection.

The executive branch of the State government consists of a governor, lieutenant governor, eight councillors who are the governor's constitutional advisers in the matter of appointments. and other minor executive duties, and who are chosen in councillor districts, a secretary of the Commonwealth, a treasurer and receiver general, an attorney general and an auditor of accounts. Beginning with the election held November 1920, these State officers and the members of the legislature, all of whom had heretofore been elected annually, are chosen biennially. Annual sessions of the legislature were continued until 1938, at which time biennial sessions were adopted. The governor is by virtue of his office commander-in-chief of the military forces of the State He has a constitutional power of veto over the acts passed by the legislature, but, notwithstanding this, vetoed bills may be passed over the veto by a two-thirds vote of both branches. Important executive functions are exercised by commissions of from one to three or more members appointed by the governor, including among others commissioners and advisory boards of agriculture, education and public welfare; commissioners and assistant commissioners of labor and industries, banking and insurance, and mental health; commissioners and associate commissioners of public works and public utilities, commissioner and deputy commissioner of correction, and commissioner and council of public health; an industrial accident board, a board of tax appeals, a board of conciliation and arbitration (dealing with labor disputes), etc. The 1917–19 revised Constitution required that on or before the first of January, 1921, these commissions and boards, and all other executive and administrative work of the Commonwealth should be organized in not more than 20 departments, in which every executive and administrative office should be placed, except those directly controlled by the governor and council. All judges are appointed by the governor and hold offices during good behavior.

The judicial system is comprised of district and municipal courts having original and concurrent civil jurisdiction with the Superior Court in actions of contract, tort and replevin and some other civil matters, and have original and concurrent criminal jurisdiction with the Superior Court of misdemeanors, felonies punishable by imprisonment in the State Prison for not more than five years, and certain other crimes, and exclusive civil and criminal jurisdiction in a few minor matters; a Superior Court with original jurisdiction of all crimes and appellate jurisdiction of crimes tried before a district court with original jurisdiction in most civil cases and original and concurrent jurisdiction with the Supreme Judicial Court; and a Supreme Judicial Court which has general supervision over all courts of inferior jurisdiction, hears appeals, decides questions of law, etc. This court has also original jurisdiction in certain cases and original and concurrent jurisdiction with the Superior Court in others The Superior and Supreme Judicial Courts hold regular term sittings in the several counties. The judicial system also includes courts of probate and insolvency in each county, a land court and juvenile sessions of district courts There are also trial justices and justices of the peace, with limited jurisdiction.

Cities are incorporated by special legislative charter, the minimum population required being 12,000. City governments are administered for the most part by a mayor and city council but provisions are made for the city manager or the commission form of municipal government,

and for proportional representation.

Towns are independent municipal bodies other than cities, the chief executive officers being the board of selectmen, elected in town meeting by those entitled to vote. The town meetings also make appropriations and decide, by vote, other important matters relating to the affairs of the towns. Provision is made for the election of town meeting members and representative town meetings in larger towns adopting the same. The cities and towns are grouped into counties, 14 in number, namely, Barnstable, Berkshire, Bristof, Dukes, Essex, Franklin, Hampden, Hampshire, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk and Worcester. The chief executive officers in the counties, with the exception of Nantucket and Suffolk, are county

commissioners, who are elected for four-year terms.

Since 1915 under the Optional Charter Law, the General Court has authority to grant or annul a city charter. The forms of city government may be the mayor and councilmanic form, elected at large, a mayor and a council elected by wards, the commission form of government and the city manager plan. The counties are less important than the towns and were organized principally for judicial purposes. Only two counties have been organized since the Revolution. The country courts are the creation of the General Court but under the constitution they enjoy the fullest measure of independence

Militia.—All able-bodied male citizens between the ages of 18 and 45 are in emergency liable to perform military duty. The ordinary State militia force consists (including officers) of land forces numbering about 12,000 men, and a naval force of 900 men. These were organized in five regiments of infantry (in two brigades), one squadron of cavalry, one regiment of field artillery, one corps of coast artillery, one field battalion of signal troops, one corps of cadets, one naval brigade and a department of sanitary troops comprising one ambulance company, one field hospital company and sanitary detachments for the various regiments.

for the various regiments.

Finances.—The following statement of Massachusetts finances for the fiscal year 1939-40 was given by William E. Hurley, treasurer and receiver general of the commonwealth:

 Balance in Treasury beginning fiscal year
 1939-40
 \$ 23,579,812 15

 Receipts from all sources, 1939-40
 334,139,081 73

 Total
 \$357,718,893 88

 Disbursements during 1939-40
 326,354,372 82

 Balance, beginning fiscal year 1940-41
 \$ 31,364,521.06

On 30 Nov. 1940 the net bonded debt of the State was: Direct, \$23,168,899, contingent, \$63,086,531, making the total net indebtedness \$86,255,430. The assessed value of all property in the state in 1939 was \$6,455,943,952, of which \$5,667,741,156 was real property and \$788,202,796 was

personal property.

Under the tax system of the State real estate is taxed to the owner wherever residing, the tax being payable in the city or town where the estate is located. Taxes on tangible personal property are payable in the city or town where the holder resides, but a new statute in operation since 1917 taxes the income only of intangible personalty, and also income in excess of \$2,000 from business, trade or profession, through the office of the State commissioner of taxation, the proceeds being distributed to the municipalities wherein the person taxed resides. Sworn returns are required under penalty.

Corporations are subject to a tax upon their capital stock, assessed and payable through the office of the State commissioner of taxation, the proceeds being distributed to the municipalities wherein the stockholders reside, in proportion to the amount of shares held by them respectively. Shares in such corporations are therefore exempted from local taxation

During the legislative session of 1922 a new State commission of administration and finance was created as a result of recommendations made by a special commission on State administration and expenditures. The new law pro-

vides that the commission created by it should be organized into three bureaus as follows: A comptroller's bureau, a budget bureau and a purchasing bureau. The legislature also thoroughly revised the banking laws of the State in order to remedy defects that were brought to light as a result of the Ponzi scandal of 1920.

Banks.—The report of the Comptroller of the Currency on 1 Jan. 1941 reported the number of operating insured banks in the State at 192, of which 125 were national banks. The total assets of these 192 banks amounted to \$2,572,954,000, of which \$1,936,591,000 was the aggregate assets of the national banks. Liabilities of the 192 banks included capital, stock, notes and debentures aggregating \$107,386,000; surplus amounting to \$114,264,000; undivided profits of \$41,392,000; demand deposits aggregating \$1,481,089,000 and time deposits amounting to \$380,921,000. The total number of all active banks in the State on 1 Jan 1939 was 391 with total assets of \$4,551,405,000. Liabilities included demand deposits amounting to \$1,034,250,000; time deposits amounting to \$1,034,250,000; time deposits amounting to \$1,3986,000; common stock of \$100,336,000; surplus amounting to \$262,279,000; and undivided profits aggregating \$134,947,000.

The banks for savings are governed by a carefully guarded statute, and these institutions as well as co-operative banks (co-operative savings and loan associations) and trust companies are under the supervision of the State commis-

sioner of savings banks.

The savings banks throughout the State have been managed conservatively and very few losses have occurred; but the expense of management is remarkably low, the percentage of expense to total assets being but 287. The co-operative savings banks, which are really building associations, receiving deposits from their members in regular monthly payments, accumulating interest thereon, and loaning the amounts received to members only, principally upon first mortgages on real estate, have been uniformly successful There are also a number of loan and trust companies, and mutual savings banks in the State.

The Massachusetts statute governing these institutions is a model in legislation of this kind, carefully protecting the interests of the members, who, by the method of regular savings inherent in the system, are gradually accumulating considerable sums in cash, or ac-

quiring home ownership.

In their relation to commerce the financial interests of the State are largely centred in Boston. The first bank in this city, one of the earliest institutions of the kind in the country, was established in 1784 and still continues. Banking operations here have generally been conducted with conservatism and prudence. Since 1898 the aggregate banking capital invested in the city has been much reduced, and weak banks eliminated or strengthened by consolidation.

Education.—From the earliest years the education of the people has been a vital subject of public concern. Harvard College at Cambridge was founded in 1636, and as early as 1647 it was provided in the colonial laws "to the end that learning may not be buried in the graves of our forefathers"... "that every

township after the Lord hath increased them to the number of fifty households, shall appoint one to teach all children to write and read; and when any town shall increase to the num-ber of one hundred families they shall set up a grammar school, the master thereof to be able to instruct youth so far as they may be fitted for the University, provided that if any town neglect the performance hereof above one year, that every such town shall pay five pounds to the next school, till they shall perform the order." The spirit of this early law still continues. It has always been the policy of the Commonwealth to preserve the principle of local control of the schools, thus promoting the direct interest of the taxpayers in the several municipalities. Hence while the State law provides under penalty that schools shall be maintained in every city and town, these are administered by local boards termed school committees, elected by the people and clothed with broad general authority Women, as well as male voters, may vote for the election of these officers. The State Board of Education, appointed by the governor, has advisory powers, intended to foster and promote the highest efficiency of the public schools, but no direct control of local schools, except in certain matters of control of the public schools, except in certain matters of control of the direct control of the schools, except in certain matters of control of the schools. ters of general concern, such as the distribu-tion of the income of the State school fund in aid of the schools in the poorer towns. This board through its agents exercises limited supervisory authority wherever aid is thus furnished. The board also directly administers the State teachers colleges established for training teachers. Such schools exist at Framingham, Westfield, Bridgewater, Salem, Worcester, Fitchburg, North Adams, Hyannis and Lowell, besides the Teachers College of the City of Boston, expressly devoted to the training of teachers in drawing and the arts of design. The buildings provided by the State design. The buildings provided by the State for normal instruction are of the highest character, of modern construction and all fully equipped. The number of students in attendance approximates 3,200.

School attendance is compulsory between the ages of 7 and 14, or if under 16 if certain educational standards have not been reached and specified requirements concerning educa-tion complied with. Public schools must be maintained at least 30 weeks in each year, providing instruction in specified subjects, except that in towns in which the taxable valuation of property is under \$200,000, the time may be reduced to 28 weeks. Cities and towns containing 500 families must maintain high schools for at least 40 weeks annually, unless exempted by the State Board of Education for valid reasons, and under conditions fixed by the board. Towns not subject to this must pay for tuition of their children in the high school of some other municipality, but sums so paid are re-imbursed by the State to towns wherein the valuation does not exceed \$1,000,000, or if the valuation exceeds this amount but if the town contains less than 500 families, 50 per cent is reimbursed. If a town containing less than 500 families, nevertheless, maintains a high school of its own, the State grants to it \$500 annually under certain conditions. Cities having 20,000 inhabitants must provide manual training. Cities and towns may establish industrial schools, and any city or town may, or under

certain industrial conditions affecting illiteracy, must maintain evening schools for instruction of persons over 14 years of age, and cities of 50,000 inhabitants must maintain evening high schools. Cities and towns may provide free lecture courses of educational value, and vacation schools are authorized, also nautical schools on shore or shipboard, and provision is made for State-aid vocational instruction, including agriculture, trades, crafts and manufacturing industries A system of continuation schools provides for the education of illiterate minors between the ages of 14 and 16 who are at work. Municipalities must employ superintendents of schools, and provision is made for the joint employment of such superintendents by the smaller towns grouped in superintendentcy unions, aided by the State under certain conditions.

Children under 14 are not to be employed for wages while the public schools are in session, and unless certain educational require-ments are complied with employment under 16 is prohibited in factories, workshops or mer-cantile establishments. There are also stringent provisions as to the employment of minors between 16 and 21, intended to prevent illiteracy. Indeed the educational requirements are so correlated with provisions as to employment and such effective means are provided for enforcement of the laws that the intellectual, moral and physical status of minors of either sex is carefully guarded. In every respect the legislation of Massachusetts of this character is upon a high plane.

There is a provision for the certification of the qualifications of high school teachers by the board of education, and a State-wide retirement system for teachers in the public schools,

with annuities and pensions.

A department of university extension, under direction of the State Board of Education, organizes and maintains a comprehensive system of extension teaching designed to supplement, or to fill gaps in, other established educational agencies, by means of vocational and cultural classes conducted by part-time teachers or by correspondence courses. Many such courses are offered for classes when they do not duplicate educational opportunities given at nominal fees by other institutions. There are no fees for instruction in such classes. Twenty students must enroll in order to form a class.

The number of children attending the public The number of children attending the public elementary schools during the year ending 30 June 1939, was 406,420; there were 106,298 in the junior high schools; and 172,426 in the high schools. The total enrolment in the public schools was thus 685,144. The school population for the year ending 30 June 1940 was estimated at 842,000 persons between the ages of five and 16 years. There were also some illiterate minors above 16 years of age. The expenditures of the year for public-school education totaled \$180,789,407 90. The year's salaries of all public-school teachers, principals, and of all public-school teachers, principals, and supervisors averaged \$1,898. The State Board of Education, in 1929, issued a regulation requiring a course of three years in the State Normal Schools as qualification for the elementary teacher's diploma. The minimum course in all the normal schools of the State was thus lengthened in 1930 to three years, which is in

accordance with the practice today of the most progressive States educationally.

The effective ventilation of school buildings is required under definite provisions of law enforced by the State inspector of factories and public buildings, and in the larger towns and cities these buildings are generally of the highest types of such edifices in this and in all other respects, large numbers having beer erected within recent years

The higher educational institutions within The higher educational institutions within the State include the following 'Harvard College (qv) at Cambridge, founded 1636; Williams College (qv) at Williamstown, 1793; Amherst College (qv) at Amherst, 1825; Mount Holyoke College (qv), for women, at South Hadley, 1837; College of the Holy Cross at Worcester, 1843; Tufts College (qv) at Medford, 1850; Massachusetts Institute of Technology at Cambridge, 1861; Boston College at Boston, 1863; Worcester Polytechnic Institute at Worcester, 1865; Boston University at Boston at Boston, 1863; Worcester Polytechnic Institute at Worcester, 1865; Boston University at Boston, 1869; Wellesley College (qv), for women, at Wellesley, 1870; Smith College (q.v.), for women, at Northampton, 1871; Clark University at Worcester, 1887–1902; Simmons College at Boston, 1899; Massachusetts College of Pharmacy at Boston, founded 1823, incorporated 1852; Middlesex University at Waltham; Wheaton College at Norton, founded in 1834 and incorporated in 1912; Northeastern University at Boston; Andover Newton Theological sity at Boston; Andover Newton Theological Seminary at Newton Center; Episcopal Theological School at Cambridge; Lowell Textile Institute at Lowell; New Church Theological School at Cambridge; St. John's Boston Ecclesiastical Seminary; Suffolk University at Boston; Regis College, Weston, Radcliffe College at Cambridge is affiliated with Harmand University. at Cambridge is affiliated with Harvard University, and is widely known as an educational institution for women. There are also numerous private schools of various grades, and junior colleges in the State.

Libraries.—Free public libraries form an important element in the educational equipment of the State. These institutions, free to all the citizens in the various cities and towns, are practically universal, only a fractional percentage of the population being without such privi-leges. The establishment of such libraries has in recent years been fostered by grants of money from the State treasury, and by the creation of a Free Public Library commission, appointed by the governor, established to promote public library usefulness and to aid in founding such institutions where not then existing. This commission makes annual reports to the legislature upon matters within its jurisdiction. There are also numerous circulating and association libraries, not free to the public. The latest returns from the public libraries within the State show more than 400 such libraries, containing about 8,256,884 bound volumes and having a circulation for home use of more than 14,033,000 volumes. The annual appropriation from taxes for such libraries by the various cities and towns totaled about \$1,355,600. The Booton Bublic Library haven libraries building Boston Public Library, housed in a building which is one of the most noteworthy architectural monuments in the United States, is (except New York) the largest free public circulating library in the country, and contains about 1,500,000 volumes; the Harvard University Library has more than 3,000,000; the Boston Athenæum, 290,000; and the public libraries at Springfield and Worcester; the State Library in the State House at Boston now contains about 587,000 books and pamphlets. The collection is surpassed only by the Library of Congress. (See LIBRARIES.)

Charitable and Penal Institutions.- The State institutions dealing with the defective classes include hospitals for the insane at Worcester, Taunton, Northampton, Danvers, West-borough, Medfield, Waltham, Monson, Boston, Foxborough and Grafton; a State colony at Gardner, the Massachusetts School for Feeble-Minded at Waltham and the State school at These institutions are under the Wrentham. general supervision of the State Board of Insanity and directly controlled in each case by a board of seven trustees, of whom five must be men and two women, one to be appointed an-nually by the governor and council, the place of the senior member being vacated each year.

General remedial institutions include a State hospital at Pondville for inebriates and victims of drug habits, seven trustees; the hospital cottages for children at Baldwinsville, with five trustees; the Massachusetts Charitable Eye and Ear Infirmary at Boston, two trustees on behalf of the State; the Massachusetts General Hospital, four trustees on behalf of the State; the Massachusetts Homeopathic Hospital at Boston, five trustees on behalf of the State; the Peter Bent Brigham Hospital at Boston, two trustees on behalf of the State. There are several sanitariums for consumptives under a State board of seven trustees All the State trustees are appointed for fixed terms by the governor. The Perkins Institution and Massachusetts School for the Blind at Watertown has four trustees on behalf of the State, similarly appointed; and the Soldiers' Home at Chelsea, three. There are special educational institutions for the deaf in which the State is interested and to which educable children of this class may be sent, in accordance with the policy of the Commonwealth which makes schooling free for all its children even when physical defects of this nature forbid their attendance upon the public day school. These comprise the American School for the Deaf at Hartford, Conn.; the Clarke School for the Deaf, Northampton; the Horace Mann School for the Deaf, Boston; the Sarah Fuller Home for Little Deaf Children, Medford; the New England Industrial School for Deaf Mutes, Beverly, and the Boston School for the Deaf. The Massachusetts Hospital School at Canton provides for the care and education of crippled and deformed children. The penal and reformatory institutions include the Lyman School for Boys at Westborough; the State Industrial School for Girls at Lancaster, and an Industrial School for Boys at Shirley, all controlled by the trustees of training schools, appointed by the governor; the State Prison at Boston (Charlestown district); the Massachusetts Reformatory at Concord; the Reformatory Prison for Women at Sherborn, and a prison camp and hospital at Rutland, all under the general supervision of the State director of prisons.

The State institutions for paupers include the State Infirmary at Tewksbury and the

State Farm at Bridgewater. The local poor, having settlements under the law in the cities and towns, are cared for

in local almshouses maintained by the municipalities. There are jails, houses of correction and truant schools in the counties. The charitable institutions established and maintained by religious bodies or other private agencies are widely distributed; and, especially, hospitals for the treatment of accidents and disease, and homes for the aged have, in recent years, been numerously established throughout the Commonwealth.

The total number of persons receiving public charity relief of all sorts (i.e., supported or relieved in public institutions, in families or in their own homes, but not including vagrants or wayfarers), naturally varies in different years, but in general it may be set down at about 100,000. The paupers in State, city and municipal almshouses number about 8,000. The total net cost of pauper relief also varies from year to year but it averages around \$9,000,000 or \$10,000,000. For the year ending 1 Nov. 1939 the whole number of insane persons in the State in care of the State Commission on Mental Diseases averaged about 20,000, besides other defectives, chiefly feeble-minded. (See Pauper-ISM.)

The total prison population 1 Nov. 1939 aggregated 4,312; of whom about one-half were confined in county jails and houses of correction

and the rest in the State prisons.

Vital Statistics.—Upon the estimated population of the State, the birth rate per 1,000 of persons living, for the year 1938, the latest for which complete figures are available, was 138; and the death rate was 11.2, the excess of births over death rate is slightly higher in the cities than in the towns. The total number of deaths for 1938 was 49,606, compared with 50,811 in 1933 The decrease in 1938 was accounted for by decreases in the death rates from diseases of the heart, pneumonia, all forms, nephritis, influenza, measles, and whooping cough. There has been a continuous increase in deaths from automobile accidents.

Manufactures.— The State is largely devoted to manufacturing, the energies of its people having been early turned in this direction, and developed by more than a century of industrial training. No special advantages exist based upon the possession of raw material, or due to natural resources, except water power, which, although changes in the methods of developing power render this less essential than formerly, is still an important factor. The climate of the southeastern part of the State is especially favorable to cotton spinning. In colonial days much was done to foster manufactures, invention has been promoted and improved craftsmanship stimulated, and the effect has been significant throughout the industrial history of the State The power loom, first constructed by Francis C. Lowell of Boston and Paul Moody of Amesbury, and put in operation at Waltham in 1814, revolutionized the cotton industry in the United States. The first cotton mill in the country was built at Beverly in 1788. As early as 1815 there were 57 cotton mills in the State with 46,650 spindles. The first attempt at woolen goods manufacture was at Rowley, in Essex County, in 1643, followed by more or less successful efforts in the same direction elsewhere in the State in the 17th and 18th centuries. The industrial history of Lowell, Lawrence and Fall River is, in effect, the history of the growth of the factory system as applied to textiles in America The boot and shoe industry, developing from crude hand process of early times to the perfected factory operations of to-day, is interwoven with the story of the growth of Lynn, Haverhill, Brockton and many smaller municipalities The first printing done in the American colonies was at Cambridge in 1639, and from this small beginning onward the printing and publishing business has been important in the State Much of the history of paper-making in

the United States is the history of the industry of Massachusetts The manufacture of india rubber goods in this country originated at Roxbury, now part of Boston, in 1833 Manufactures of metal, machinery of all kinds wooden goods, jewelry, clothing, cordage, rattan and other furniture have always been important

The following tables, compiled from the report of the United States Bureau of the Census, give the latest available information relative to manufacturing in Massachusetts in the aggre-

gate and for principal industries.

Principal Industries. Massachusetts, 1939

PRINCIPAL INDUSTRIES. AIASSACHUSEITS, 1969					
Industry	Number of establish- ments	Wage earners	Wages	Cost of materials	Value of products
All industries, total: 1939 1937	9,007 8,619	460,674 496,036	\$500,923,284 556,076,897	\$1,271,451,635 1,364,299,029	\$2,459,771,043 2,620,788,793
Industries, 1939 Bookbinding and related industries Boot and shoe cut stock and findings	81 294	2,761 7,345	3,192,875 6,577,448	2,837,219 35,859,402	9,911,387 52,753,340
Bread and other bakery products (except biscut, crackers, and pretzels)	1,101 25 107	11,540 1,746 5,796	15,550,261 1,815,835 4,884,904 903,161	31,845,003 5,437,858 15,710,373 9,070,811	66,622,476 9,942,865 27,835,532 12,086,858
Chocolate and cocoa products Clocks, watches, and materials and parts (except watchcases) Coated and glazed paper Communication equipment	5 8 23 14	2,758 1,107	3,218,044 1,406,135	3,586,662 8,186,960	10,478,481 13,026,943
Converted paper products not elsewhere classi		2,580 3,568 27,646	2,478,020 3,921,065	4,237,733 11,741,270 32,177,131 3,971,957	9,714,532 23,001,985
fied Cotton broad woven goods Cotton narrow fabrics Cotton yarn Curtams, draperies, and bedspreads—made in regular factories or by jobbers engaging	34 16	2,613 4,823	23,487,567 2,242,053 3,738,279	3,971,957 7,366,444	68,520,696 9,177,924 13, 709,711
Contractors	52	2,005	1,172,273	8,202,301	11,064,784
Cutlery (except aluminum, silver, and plated cutlery) and edge tools	43 39	2,349 744	2,858,384 779,139	2,844,259 6,636,894	12,678,432 13,942,218
Dyeing and finishing cotton, rayon, silk, and linen textiles Footwear (except rubber). General commercial (job) printing. Household furniture except upholstered	38 275 504 89	9,331 45,595 4,419 3,299	10,105,433 38,065,411 5,743,518 3,267,694	34,506,760 76,176,445 7,226,089 5,490,400 6,475,047 6,345,547	53,565,356 142,110,567 20,878,188 12,360,515
Ice cream and ices	121 25	608 1,242	3,267,694 692,705 1,219,672	1	12,360,515 12,291,063 9,363,914
lar factories or jobbers engaging contractors Machine-shop products, not elsewhere classified Machine-tool and other metal-working machinery accessories, metal-cutting and shaping tools, and machinists' precision tools	77 111	7,432 2,901	9,742,835 3, 661,897	43,049,959 5,200,310	63,669,127 14,009,251
Walt liquors	48 48 15 28	3,237 3,569 754 2,082	4,038,818 6,013,687 1,271,351 3,211,983	2,865,139 6,914,587 3,864,697 37,052,259	13,208,415 24,590,740 11,838,692 43,569,671
Meat packing, wholesale. Men's and boys' shirts (except work shirts), collars, and nightwear—made in inside fac- tories or by jobbers engaging contractors	12	3, 203	2,293,441	5,649,666	10,085,856
tories or by jobbers engaging contractors. Men's and boys' suits, coats, and overcoats (except work clothing)—made in inside fac- tories or by jobbers engaging contractors. Newspapers: publishing and printing.	95 144	5,370 5,045	5,452,292 9,590,531 936,919	15,289,999 11,713,807	25,522,060 43,985,352
Newspapers: publishing and printing. Nonalcoholic beverages Ophthalmic goods: lenses and fittings. Paints, varnishes, and lacquers. Paper and paperband mills	162 14 47 71	885 3,319 666 9,904	936,919 3,886,788 798,088 12,084,248	4,299,223 4,322,334 6,265,795 34,978,887	11,410,612 13,682,216 11,704,739 65,058,084
Paper and paperboard mills	117	5,125	5,183,098	16,694,039	29,616,614
Rayon broad woven goods—regular factories or jobbers engaging contractors	16	8,270	7,300,099	21,757,244	33,400,499
footwear with fabric uppers)	4 63	5,271 7, 343	6,301,234 7,196,890	6,733,732 22,741,162	, 19,304,073 41,438,805
ments	85 26	928 1,809	1,006,993 2,233,221	12,235,747 3,189,710	15,829,085 9,419,141
naces (except electric)	15 14	1,990 3,555	2,782,615 5,670,563	4,717,101 10,271,995	11,829,114 22,427,537
Woolen and worsted manufactures—regular	52	2,384	2,258,462	9,103,759	14,252,759
factories and jobbers engaging contractors	109	42,368	41,641,234	117,234,722	190,655,164

Manufacturing in Massachusetts

	1929	
Number of factories	9,952	8,316
Wage-earners	559,443	442,649
Wages paid \$ 6	95,351,100	\$ 445,830,970
Cost of materials 1,6	35,585,153	1,075,397,946
Value of output 3,3	92,149,485	2,095,389,595
Added by manufacture 1,7	06,564,332	1,010,424,914

In the table on page 408 is shown the value of the output of the leading industries in 1935, the detailed figures for later years not being

available.

Agriculture.—The agriculture of the State, as compared with that of the great farming
States of the West, is not important. The industry has always been secondary to manufacturing. Following the lines of least resistance, it has turned chiefly to the production of milk, eggs, poultry and such vegetables as find a ready market in the growing factory towns and cities almost at the farmer's door. The following table, compiled from data supplied by the United States Bureau of the Census, and the United States Department of Agriculture, gives interesting comparisons relative to the agricultural situation in Massachusetts.

ACRICIII TURAL STATISTICS

AGRICULTURAL	STATISTICS	;
Item	Census of 1940	Census of 1930
FARMS, FARM ACRE		
Number of farms	31,897	25,598
Full owners	27,446 1,626	
Managers	560 2,265	958
Value of farms (land and buildings)	•	\$261,222,390
Average value per farm	\$6,647	\$10,205
Average value per acre	\$109 40	\$130 26
All land in farms, acres	1,937,963	2,005,461
Average acreage per farm.	60.8	78 3
FARM LAND ACCORDING	TO USE (A	cres)
Cropland harvested	456,267	474,167
Crop failure	21,655	9,917
Cropland, idle or fallow	79,868	79,970
Plowable pasture	230,025	161,685
Woodland	716,862 433,286	862,569 417,15 3
All other land	433,286	417,153
Land available for crops	787,815	725,739
Land available for crops (Harvested, failure, idle or		
fallow, and plowable pas- ture)	•	
LIVESTOCK ON FAR	ME (NTMET	1
		24,658
Horses and colts	19,56 7 146	
Mules and mule colts	180,833	
Cattle		104,503
Cows and heifers 2 years		
old and over on 1 Jan. of	138,555	121,247
Cows and herfers milked	129,481	
Sheep and lambs	7,050	
Hogs and pigs	62,285	
Chickens	3,138,271	1,925,852
The following table.		rom the re-
THE TOHOWING LADIE, C	COLLIDATION A	COLLE CALC TO

following ta ports of the United States Department of Agriculture, shows the harvested acreage and yield of specified crops in indicated years.

Acreage and Production of	f Selected	Crops
Crop	1929–38 Average	1940
Corn: Acreage Production—bus.	39,000 1,586,000	38,000 1,558,000
Hay: Acreage Production—tons	372,000 496,000	409,000 594,000
Tobacco: Acreage Production—lbs.	6,030 8,515,000	6,100 9,281,000
Potatoes: Acreage Production—bus.		19,000 3,135,000
Apples: Production—bus		2,174,000

Production—bus.	•••••••	110,000	7 6,000
Grapes > Production—tons		644	780

The Fisheries.—The fishing industry has, from the earliest years, been an important element in the prosperity of the coast towns and the hardy seamen of Gloucester and Marblehead, engaged in this industry in times of peace, have won renown in the naval operations of the country in times of war.

Boston, of course, is the chief port of entry, and in the aggregate value of investments and and in the aggregate value of investments and earnings derived from ocean commerce exceeds all others. Lines of passenger and freight steamers regularly ply between Boston and European ports, and the coastwise passenger and freight traffic to the east and south is

important.

Transportation.—In the early Colonial days the little traveling that was done was over water routes and in winter land travel was facilitated by sleighs which could utilize the ice on the lakes and rivers. Not until the latter half of the 18th century did the stagecoach come into being and then the service was limited to the larger towns and to the principal communities along the coast. The stage line from Boston to Providence was one of the earliest. At the close of the Revolutionary War the need for transport facilities began to be felt most keenly and the first demands for roads were heard. The early roads were built by private companies incorporated by the General Court. These turnpikes as they came to be called were operated by the owner companies for the revenue derived from tolls In the early years of the 19th century stagecoaches branched out to practically all sections of the State, and the Concord coach became so famous that when the railroads came its body was the model used in the early passenger coaches. When the canal building boom hit the country it aroused little enthusiasm in Massachusetts and the Middlesex was the only considerable artificial waterway constructed in the State. It joined the Merrimack River near Lowell to the Charles River in Boston. In 1835 railroad construction began in the State. In that year, the Boston and Lowell, the Boston and Worcester and the Boston and Providence roads were completed The Western Railroad from Worcester to Springfield was constructed in 1837. Transportation facilities have kept pace with the industrial development of the State. Boston the chusetts and the Middlesex was the only conindustrial development of the State. Boston, the metropolis, is connected with the West by two railway systems, and these communicate either directly or by branches with all the leading industrial centers. One general system, with its various divisions, communicates with the South by way of New York, uniting important manufacturing cities and towns, while a network of main and branch lines connects the northern and eastern factory centers of the State with each other, with the seaboard and with the railway systems leading south and west

While the railroads spread to every part of the State intracity transportation also developed. Boston inaugurated its first street railway in 1836. The horse remained supreme in city transportation for over 50 years and it was not until 1890 that electricity superseded him as a motive power. With the 20th century came the automobile and new methods of both freight and passenger transportation undermined both the railroads and the electric street railways. At present great bus lines have largely supplanted the railways for both passenger and short-haul freight services. With the automobile the demand for good roads resulted in the construction of a vast State network of improved highways suitable for travel in all weathers. Long before the turnpike companies had reverted to the control of the towns and in the early nineties it was found that the roads were in very poor condition. A State highway commission was charged Today motor to lay out and maintain roads Today motor vehicle fees and gasoline taxes help maintain the modern State highway system.

GOVERNORS OF MASSACHUSETTS. GOVERNORS OF PLYMOUTH COLONY Chosen annually by the People

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Chosen annually by
1620 Nov 11, John Carver
1621 April — William Bradford.
1633 Jan 1, Edward Winslow.
1634 Mar 27, Thomas Prence.
1635 Mar 3, William Bradford.
1636 Mar 1, Edward Winslow.
1637 Mar 7, William Bradford.
1638 June 5, Thomas Prence.
1639 June 3, William Bradford.
1644 June 4, William Bradford.
1654 June 4, William Bradford.
1657 June 3, Thomas Prence.
1673 June 3, Josiah Winslow.
1680 Dec. 18, Thomas Hinckley.*
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GOVERNORS OF MASSACHUSETTS BAY COLONY Chosen annually under the First Charter

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1629 Mar 4. Matthew Cradock.†
1629 April 30, John Enducott †
1629 Oct. 20, John Winthrop †
1634 May 14, Thomas Dudley.
1635 May 6, John Haynes.
1636 May 25, Henry Vane.
1637 May 17, John Winthrop.
1640 May 13, Thomas Dudley.
1641 June 2. Richard Bellingham.
1642 May 18, John Winthrop.
1644 May 29, John Enducott.
1645 May 14, Thomas Dudley.
1646 May 6, John Winthrop.
1649 May 2, John Enducott.
1650 May 22, Thomas Dudley.
1651 May 7, John Enducott.
1654 May 3, Richard Bellingham.
1655 May 3, Richard Bellingham.
1655 May 3, Richard Bellingham.
1657 Dec 12, John Leverett (acting).
1673 May 7, John Leverett (acting).
1679 May 28, Simon Bradstreet (to May 20, 1686).

The Inter-Charter Person
      1629 Mar 4, Matthew Cradock.†
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THE INTER-CHARTER PERIOD.

May 25, 1686, Joseph Dudley became president of New England under royal commission, holding the office until 20 December, the same year, when Sir Edmund Andros became governor of New England, appointed by King James II. On 18 April 1689, Governor Andros was deposed by a revolution of the people. After the dissolution of the first charter, Simon Bradstreet was governor from 7 June 1689 to 16 May 1692. GOVERNORS OF THE PROVINCE OF MASSACHUSETTS BAY

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Appointed by the King under the Second Char

1692 May 16, Sir William Phips.
1694 Dec. 4, William Stoughton (acting).
1699 May 26, Richard Coote (Earl of Bellomont).
1700 July 17, William Stoughton (acting).
1701 July 7, The Council
1702 June 11, Joseph Dudley.
1715 Feb 4, The Council
1715 Mov. 9, William Tailer (acting 1).
1716 Oct. 5, Samuel Shute.
1723 July 19, William Dummer (acting).
1728 July 19, William Dummer (acting).
1730 June 11, William Dummer (acting).
1730 June 11, William Dummer (acting).
1730 Aug. 10, Jonathan Belcher.
1741 Aug. 14, William Shirley.
1749 Sept 11, Spencer Phips (acting).
1753 Aug. 7, William Shirley.
1755 Sept 25, Spencer Phips (acting).
1757 April 4, The Council
1757 Aug. 3, Thomas Pownal.
1760 June 3, Thomas Fownal.
1760 Aug. 2, Francis Bernard.
1760 Aug. 2, Francis Bernard.
1760 Aug. 2, Thomas Hutchinson (acting).
1771 Mar. 14, Thomas Hutchinson.
1774 May 17, Thomas Gage

UNTIL THE CONSTITUTION
                                                                            Appointed by the King under the Second Charter
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UNTIL THE CONSTITUTION

1774 Oct , A Provincial Congress. 1775 July, The Council

UNDER THE CONSTITUTION Governors elected annually

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UNDER THE CONSTITUTION

Governors elected annually

1780-85, John Hancock.

1785-87, James Bowdom

1787 (to Oct 8, 1793), John Hancock §

1793 (from Oct 8), Samuel Adams (acting) ¶.

1794-97, Samuel Adams

1797 (to June 7, 1799), Increase Sumner ¶ (Federalist).

1799 (from June 7 to May 20, 1800), Moses Gill (acting) ¶

(Federalist)

1800-07, Caleb Strong (Federalist).

1807 (to Dec. 10, 1808), James Sullivan, § (Dem -Rep.).

1808 (from Dec. 10, 1evi Lincoln (acting), ¶ (Dem -Rep.).

1809-10, Christopher Gore (Federalist).

1810-12, Elbridge Gerry (Democratic-Republican),.

1812-16, Caleb Strong (Federalist).

1823 (to Feb. 6, 1825), William Eustis, § (Dem.-Repub.).

1825 (from Feb. 6), Marcus Morton (acting), ¶ (Dem -Repub.).

1825 (from Feb. 6), Marcus Morton (acting), ¶ (Dem -Repub.).

1825 (from Mar. 1), Samuel T. Armstrong (acting), ¶ (Whig.).

1836 (Fom Mar. 1), Samuel T. Armstrong (acting.), ¶ (Whig.).

1841-43, John Davis (Whig.).

1844-43, John Davis (Whig.).

1844-51, George N. Briggs (Whig.).

1853-54, John H. Clifford (Whig.).

1853-55, Emory Washburn (Whig.).

1853-55, Emory Washburn (Whig.).

1858-61, Nathaniel P. Banks (Republican).

1866-69, Alex H. Buillock (Republican).

1866-72, William Claffin (Republican).

1874 (from May 1, 1874), Wm. B. Washburn, || (Republican).

1875-76, William Gaston (Democrat).
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* Mr. Hinckley was governor till the union of the colonies in 1692, except during the administration of Sir Edmund Andros

Andros.

A royal patent (3 Nov. 1620) created the Council for New England with definitions of territory 19 March 1628, the council granted to Sir Henry Rosewell and others the territory afterward confirmed by royal charter to the "Governor and Company of the Mattachusetts Bay in Newe England." This charter which passed the seals 4 March 1629, designated Matthew Cradock as the first governor of the company. On 13 May 1629, Cradock was rechosen by the company, but never came to New England 20 Oct. 1629, John Winthrop was chosen governor by the company. John Endicott had been sent over as their agent by the grantees under the instrument of 19 March 1628. While Cradock was the nominal governor a commission was sent out, dated 30 April 1629, to Endicott at Salem appointing him "Governor of London's Plantation in the Mattachusetts Bay in Newe England." In the exercise of his duties he was subordinate to the governor in London. Cradock and Endicott were thus chief governor and local governor, respectively, until 20 Oct. 1629, the date of the commission of Winthrop (who had not then arrived); and Winthrop and Endicott were chief and local governors, respectively, until the arrival of Winthrop at Salem, with charter, 12, June 1630, when Endicott's powers were merged in the general authority of Winthrop.

10 9 Nov. 1715, Elizeus Burgess was proclaimed governor, he having been commissioned 17 March 1715, but he never came over to perform his duties, and resigned in April 1716.

Solved in office.

Solved in office.

Lieutenant-governor, acting governor during a vacancy. One of these, Moses Gill, died while so acting, 20 May 1800, and the Commonwealth, for the only time under the constitution, was without a governor or lieutenant-governor. The council, Hon. Thomas Dawes, president, officiated until the 30th of the month, when Caleb Strong was inaugurated

arnor.
|| Resigned upon election to the Senate of the United States.

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1876-79, Alex. H. Rice (Republican).
1879-80, Thomas Talibot (Republican).
1880-83, John D Long (Republican).
1883-84, Benjamin F. Butler (Democrat and Independent).
1884-87, George D. Robinson (Republican).
1887-90, Oliver Ames (Republican).
1890-91, John Q A Brackett (Republican).
1890-91, John Q A Brackett (Republican).
1891-94, William E Russell (Democrat).
1894 (to Mar 5, 1896), Frederic T. Greenhalge* (Republican).
1896 (from Mar. 5), Roger Wolcott (acting),† (Republican).
1897-1900, Roger Wolcott (Republican).
1903-03, W Murray Crane (Republican).
1903-05, John L. Bates (Republican).
1903-05, John L. Bates (Republican).
1906-09, Curtis Guild, Jr (Republican).
1906-09, Curtis Guild, Jr (Republican).
1911-14, Eugene N Foss (Progressive-Democrat).
1911-14, Eugene N Foss (Progressive-Democrat).
1914-16, David I Walsh (Democrat).
1919-20, Calvin Coolidge (Republican).
1920-25, Channing H Cox (Republican).
1923-29, Alvan T. Fuller (Republican).
1923-29, Alvan T. Fuller (Republican).
1931-35, Joseph B. Ely (Democrat).
1931-35, Joseph B. Ely (Democrat).
1937-39, Charles F. Hurley (Democrat).
1937-39, Charles F. Hurley (Democrat).
1939- Leverett Saltonstall (Republican).
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MASSACHUSETTS AGRICULTURAL COLLEGE, at Amherst, Mass., a coeducational institution, chartered in 1863 and opened in 1867 by the State. The college farm is over 700 acres, which comprises the campus, experiment station, and grounds for horticulture and farming, a demonstration forest has 755 acres. The work is experimental on the part of the students. The regular course extends over four years, but special courses are given for women desiring to study dairying, market gardening and some other subjects. Winter courses are provided for those unable to take the four years' work. The regular courses lead to the degrees BS, MS., MAgr and PhD. The Stockbridge School of Agriculture has been offering "short courses" since 1928 The college plant is valued at about \$2,800,000; annual income approximates \$1,500,000; student-body in the regular courses numbers about 650.

MASSACHUSETTS BALLOT. See BALLOT

MASSACHUSETTS BAY, an arm of the Atlantic indenting the eastern shore of Massachusetts and extending from Plymouth Harbor on the south to Cape Ann on the north, a distance of 42 miles. It is triangular in shape, the north and south shores inclining toward each other until at the entrance to Boston Harbor they are about five miles apart. The depth from the base of the triangle to Boston Harbor is about 21 miles. The northern shore is rocky and irregular, the southern low and sandy. The principal inlets are: on the north coast, Gloucester and Nahant bays and Salem, Marblehead and Lynn harbors, and on the west Boston Harbor. Along the shores are a number of capes and headlands, and off the coast a number of small islands. At the entrance to Boston Harbor there are several islands, on some of which are fortifications. Cape Cod Bay on the southeast is sometimes included in Massachusetts Bay.

MASSACHUSETTS BAY COLONY. See Massachusetts, History.

MASSACHUSETTS HISTORICAL SO-CIETY. An association of savants, founded in the city of Boston in 1791 and incorporated in 1794. It is thus the oldest historical society within the limits of the United States. Its headquarters is in Boston and it has for object the collection, preservation and diffusion of the materials for American history, especially Americana and documents relating to the early history of the Massachusetts Bay Colony. In 1792, the year following its foundation it issued the first volume of its «Collections.» Over 70 other volumes of the «Collections» have since appeared together with over 50 volumes of «Proceedings.» The society also published a new and illustrated edition of Bradford's (History of the Plymouth Plantation, 1620–1647, in two volumes. The society also maintains a museum of relics and antiquities and a great library of 60,000 volumes, 120,000 pamphlets, etc. The library contains a large collection of rare manuscripts including the Winthrop manuscripts on the early settlement of New England

Revised.

^{*} Died in office.
† Lieutenant-governor, acting governor during a vacancy. One of these, Moses Gill, died while so acting, 20 May 1800, and the Commonwealth, for the only time under the constitution, was without a governor or lieutenant-governor. The council, Hon. Thomas Dawes, president, officiated until the 30th of the month, when Ca' b Strong was inaugurated governor.

and the collections of the late Francis Parkmen relating to the settlement of Canada by the

French.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY. With a lively and prophetic vision of the part that science was capable of playing in advancing human welfare William Barton Rogers (1804–1882), geologist and natural philosopher of the University of Virginia, planned and worked for nearly a decade prior to the Civil War for the establishment of a great institute of technology. He selected Boston as the most advantageous location because, as he said, "ever since I have known something of the knowledge-seeking spirit and the intellectual capabilities of the community in and around Boston, I have felt that it was the most certain to derive the highest benefits from a polytechnical institution. The occupations and interests of the great mass of the people are immediately connected with the applications of physical science, and their quick intelligence has already impressed them with just ideas of the value of scientific teaching in their daily pursuits"

As stated in its charter, granted by the Commonwealth on 10 April 1861, the Massachusetts Institute of Technology was established «for the purpose of instituting and maintaining a society of arts, a museum of arts, and a school of industrial science and aiding generally by suitable means the advancement, development and practical applications of science in connection with arts, agriculture, manufactures and commerce.» As its first president, Rogers, aided by farsighted colleagues, set the Institute squarely on the course laid down in this charter and engendered among the staff those high ideals of intellectual leadership and public service that have given vitality to the Institute throughout its history, and that have made it, not the local institution originally planned, but one of national and international influence Motivated by the pioneering spirit of its founder, the institute proceeded rapidly to make many seminal contributions to education and industry. It pioneered in extending the laboratory method of instruction as an indispensable educational technique. It virtually created the modern profession of chemical engineering; its courses in electrical and areonautical engineering and in applied physics were probably the first in the world It was the first technological institution to recognize and provide for the important place of economics in the training of the engineer, and in collaboration with a sister institution it established the first systematic training in public health.

From the rented rooms in which it started with 15 students, the institute has grown until it has a student body of 2,900, including 600 graduate students, a staff of over 500, a plant and endowment representing an investment of over \$50,000,000, and a living alumni body of 32,000 in 82 countries. The original school of industrial science has grown into the four schools of today, the School of Science, the School of Engineering, the School of Architecture, and the Graduate School, which together offer over

900 subjects of instruction.

In attaining its present position, the institute has constantly kept before it three objectives—the education of men, the advancement of knowledge, and the rendering of service to

industry and the nation. It aims to give its students such a combination of humanistic, scientific, and professional training as will fit them to take leading positions in a world in which science, engineering and architecture are of basic importance. This training is especially planned to prepare students, according to their desires and aptitudes, to become practising engineers or architects, investigators, business executives, or teachers. The useful knowledge and mental discipline gained in this training are, however, so broad and fundamental as to constitute an excellent general preparation for other careers

Realizing that the institute trains for life and for citizenship, as well as for a career, its staff seeks to cultivate in each student a strong character, high ideals and a worthy purpose

as well as a keen intellect

To vitalize its educational procedure and to fulfill its objectives, the institute is placing increasing emphasis on original research in pure and applied science. Experience has demonstrated that teaching of the highest type, especially in science and its applications, thrives best in an atmosphere of steady progress in the understanding of the subject taught. He who is still a student, who is still himself learning, whether it be new relationships of the most fundamental scientific nature, or sounder and more economical ways of applying scientific knowledge for the promotion of industry and the public welfare, can best guide those about to enter upon a professional career.

Advancement in professional understanding is best acquired by intimate association with creative workers who are, through research, extending the boundaries of their professions. The most striking features of research in science and engineering at the institute are the spirit of co-operative effort in which it is conducted and the extent to which both undergraduate and graduate students participate in it as an integral part of their educational experience.

In recent years there has been a marked trend at the institute toward greater flexibility in the curriculum, and more individual treatment of students. This results from a developing policy on the part of the faculty of making it possible for each member of the student body to follow the line of his special interests, with ample opportunity to work closely with members of the staff, but with no lessening of the emphasis which the institute has long placed on the fundamental sciences as a basis for advanced science or engineering.

For many years Massachusetts Institute of Technology has been notable for the large amount of study of the humanities which is included in its regular curricula. There has also been a wholesome regard for those extracurricular activities which tend to broaden a man's outlook, and these have had the cordial support of faculty and administration.

The institute offers both undergraduate and graduate courses of study. The former lead to the degrees of Bachelor of Science (SB.), Bachelor in Architecture (BArch) or Bachelor of Architecture in City Planning (BArch in C.P.) the latter, to the degrees of Master of Science (SM.), Master in Architecture (MArch), Master in City Planning (MC.P.), Doctor of Philosophy (Ph.D.), Doctor of Sci-

ence (Sc.D.), or Doctor of Public Health (Dr.P.H.). It also affords to advanced students and to experienced investigators opportunities for the pursuit of original scientific

investigations.

Following are the courses of study which a student may pursue toward a degree School of Architecture Architecture, City Planning; School of Engineering Aeronautical Engineering, Building Engineering and Construction; Business and Engineering Administration; Chemical Engineering, Civil Engineering; Electrical Engineering; General Engineering; Marine Transportation; Mechanical Engineering; Marine Engineering School of Science: Biology and Public Health; Chemistry; General Science; Geology; Mathematics and Physics.

In addition to the above, a five-year course in economics and engineering or economics and natural science is offered which leads to the degree of Bachelor of Science in that one of the above professional courses in which undergraduate work is taken, together with the degree of Master of Science in Economics and Engineering or Economics and Natural Science Consult Davis, T. L. and Goodwin, H. M., History of the Departments of Chemistry and Physics of the Massachusetts Institute of Tech-

nology, 1865-1933' (1933).

ALLEN W Horton, Jr.,

Assistant to the President, Massachusetts
Institute of Technology

MASSACHUSETTS MEDICAL SOCIETY, an association incorporated at Boston, Mass, I Nov 1781, and holding regular sessions from that date to the present. Its charter was signed by John Hancock, first State governor of Massachusetts. Physicians and surgeons, who have made their medical studies colleges approved by the society and who have been examined by its censors and are of known probity, are eligible to membership. Women were first admitted in 1884. Since 1790 it has regularly issued its 'Medical Communications' It also issues a 'Pharmacopœia' and 'Publications,' various reports and essays, an annual directory, and, since 1789, a triennial catalogue The society is a potent force in maintaining a high standard in the medical profession It has about 3,500 members.

MASSACHUSETTS STATE COLLEGE,

MASSACHUSETTS STATE COLLEGE, co-educational institution at Amherst, Mass, chartered in 1863 under the provisions of the Morrill Act and opened by the State in 1867. It was named Massachusetts Agricultural College until this name was changed by act of the Legislature in 1931 The campus is 734 acres in extent, of which about 240 acres are devoted to the farm. An additional 755 acres are devoted to Mount Toby demonstration forest. The undergraduate courses are largely scientific and technical in nature and are divided into six major divisions: physical and biological sciences, social sciences, home economics, horticulture, agriculture and physical education In addition there is a two-year vocational course known as the Stockbridge School of Agriculture and a program of short non-credit winter courses for adults. Regular courses lead to degrees of B.S., A.B., M.S., B.L.A., M.L.A., and Ph.D. Enrolment in 1938: undergraduates, 1,111; graduate school, 298; Stockbridge School, 280; other, 286. There are 130 instructors on

the teaching faculty. The library has 100,000 bound volumes and 100,000 pamphlets and contains one of the best collections in agriculture and related sciences in the country. The buildings and grounds are valued at \$2,918,665 and the equipment at \$1,120,720. Headquarters of the Massachusetts Agricultural Experiment Station and the Massachusetts Extension Service are maintained on the campus and much of the facilities of this division is available as supplement to undergraduate and graduate study.

ment to undergraduate and graduate study.

Massachusetts State College shares with
the Massachusetts Institute of Technology income from Federal funds available under the
Morrill Act which established the land-grant

colleges.

MASSACRE (French, massacre, slaughter, probably connected with Latin, macellum, a meat-market), the indiscriminate and unnecessary slaughter of human beings, and, in a transferred sense, of animals. In the case of human beings it implies the absence of all forms of law or of sufficient grounds.

MASSACRE OF THE INNOCENTS, the slaughter of the children in and about Bethlehem by the soldiers of Herod, whose superstitious fears caused him to see a rival in the babe of whose birth he was apprised by the wise men (Matthew II, 1-16). The story has been for centuries a favorite subject with artists, especially those of the Flemish and Italian schools Intense realism is usually injected into the scene and also a wealth of detail. Among the greatest examples are those by Tintoretto in the Scuola di San Rocco, Venice; Remi in the Gallery, of Bologna; Daniele da Volterra in the Uffizi Gallery, Florence; Rubens in the Pinakothek of Munich and Breughel in the Gallery of Vienna.

MASSAGE, a procedure, usually performed by the hands, such as friction, kneading, rolling and percussion of the external tissues of the body, either to relieve pain or to assist a cure, or with some hygienic object in view. A male massagist is known as a masseur, a female as a masseuse Massage in some crude form has always been used by savages as well as by the civilized. It was mentioned by Homer and Hippocrates, having been one of the luxuries of the ancient Greeks, and, among the Romans, was largely used by gladiators, and to make slaves more comely by filling out their tissues. Sometimes it was done by medical practitioners, often by slaves and priests and those appointed to anoint the wrestlers before and after they exercised. Hippocrates says that "rubbing can bind and loosen, can make flesh and cause parts to waste; hard rubbing binds; soft rubbing loosens; much rubbing causes parts to waste; moderate rubbing makes them grow" Manual treatment of the body was long ago practised by the Chinese, and the Japanese, Turks, Egyptians and people of various nationalities have employed it in some form from early times."

Often the use of massage is associated with that of certain active and passive movements known as the Swedish movement-cure (q.v.), established by Pehr Henrik Ling. His system of gymnastics became popular in spite of opposition and of the fact that it was largely a revival of old methods of treat-

ment. In 1873 Mezger, of Amsterdam, and in 1877 S Weir Mitchell of Philadelphia pushed forward the cause of massage To-day it is considered by physicians as a branch of medical treatment, useful in certain cases if rightly administered, but capable of doing harm when improperly applied. Unfortunately the laity frequently look upon it as a sole means of relation care. Much depends upon the independ lief or cure. Much depends upon the judgment and skill of the masseur, as the special reaction of the individual patient has to be considered and, on the other hand, a skilful operator can accomplish more in a quarter of an hour than an ignorant one can in an hour The procedan ignorant one can in an hour The procedures in massage may be placed under four heads: stroking (the effleurage of the French), kneading (malaxation), friction and percussion. Stroking is performed over surfaces with the palm of the hand or its radial border, or with the pulps of the fingers, or the sides of the knuckles Kneading is the grasping of muscles, etc, with both hands or between the thumb and fingers of one hand, and rolling and squeezing them. Friction is a peculiar and forcible circular rubbing. Percussion is the striking or beating of a part, either with the hand or an instrument called a percussor or muscle-beater. A special technique of massaging the face, and particularly the ears and eyes, has had surprisingly gratifying results in preventing deafness and curing certain types of blindness, for instance, where an embolism of a central artery of the retina has been removed by massage. It is claimed that the modern system of massage and the the blood circular modern freely sage makes the blood circulate more freely, strengthens muscle-fibres, causes effusions and exudations to be absorbed, improves secretory and excretory action, and invigorates the whole and excretory action, and invigorates the whole system. It is frequently used with good results to stimulate assimilation and invigorate digestion, to soothe nervous irritability, relieve pain and arouse nerve-force, to equalize the circulation, to remove morbid deposits from around joints, to restore mobility, and for the correction of obstinate constipation and other disordered conditions disordered conditions.

From the point of view of the modern study of unconscious mentality it will be seen that those persons who are the greatest advocates of massage will be the ones who are unconsciously satisfying a desire for stroking, kneading, friction and percussion. Such a method of curing their ills will make an immediate and a strong appeal to their instincts. This presupposes a physical and mental make up, predisposed by early development, to seek and get satisfactions from the skin and muscle sensations derived from manipulation at the hands of another. This mental disposition is in modern times well recognized in psychoanalysis (q.v.), which, however, goes at the treatment in another way. For any diseases which may be helped by massage, there is a cause in the way in which the mind unconsciously regards the pleasures derived from the manipulation of the skin and muscles. If, for instance, the individual is of such a mental constitution that, because of early environment, he has been led to derive more than ordinary pleasure from being stroked, kneaded, rubbed or even beaten (and the history of the development of massage shows that such persons are quite numerous); such an individual will be the more likely to contract diseases of the type which are on rec-

ord as having been remedied or cured by massage. He will develop those diseases instinctively without knowing the connection between them and the unconscious wish which is the cause of the specific incidence of the symptoms. This practically amounts to saying that the diseases which are enumerated as having been cured by massage are diseases which are virtually selected by the unconscious because of the fact that their treatment will involve the gratification of wishes for just such specific stimulation of the muscular, tendonous and cutaneous end organs. The patient will do well under such a treatment, at least, partly because a source of unconscious gratification closed to him possibly since early childhood has been through massage reopened to him

MASSAGETÆ, ma-saj'ē-tē, in ancient history, a name given to nomadic tribes of northern Asia who dwelt to the east and south of the Caspian Sea. Herodotus says they worshiped and offered horses to the sun, had a community of wives, killed and ate their aged people, lived chiefly on the milk and flesh of their herds and on fish, and fought on foot and on horseback with lance, bow and double-edged axe They are chiefly mentioned in connection with Persian history Cyrus the Great perished in war with the Massagetæ, 529 BC. According to some they belonged to the Mongolian stock, according to others to the Aryan.

MASSASOIT, mas'a-soit, American Indian chief, sachem of the Wampanoags. b. Massachusetts, 1580; d. 1661. His dominion extended over nearly all the southern part of Massachusetts. setts, from Cape Cod to Narragansett Bay; but his tribe, once estimated at 30,000 in number, had shortly before the landing of the Pilgrims at Plymouth been reduced by a disease, supposed to have been yellow fever, to barely 300. On 22 March 1621, a little more than three months after the founding of Plymouth, he appeared before the infant settlement with 60 of his warriors, armed and painted, for the purpose of forming a friendly league with the white men. Although the tribe were reputed to be cruel and treacherous, the open and friendly greeting of Massasoit so favorably impressed Governor Carver, that after the necessary formalities were concluded, he formed in behalf of the colony a treaty of peace and mutual protection with the Wampanoags, which for 50 years was sacredly kept by both parties. The friendly disposition of Massasoit toward the colonists never relaxed. He lived within the limits of what is now the town of Warren, R. I., near an abundant spring which yet bears his name, where he often entertained wandering pilgrims or administered to their necessities. Roger Williams, while on his way to Providence, was for several weeks his guest at this place. Massasoit was just, humane and honest, never violating his word and constantly of peace. In person, Morton says, in his 'Memorial,' he was "a portly man in his best years, grave of countenance, spare of speech. His second son, Pometacom, called by the colonists King Philip, who ultimately became sachem of the Wampanoags, was of a less placable disposition, and allowed the encroachments of the colonists to hurry him into the bloody contest known as King Philip's War. Consult Baker, Virginia, 'Massasoits' Town Sowams in Pokanoket' (Warren, R I, 1904)

MASSASSAUGA, măs-a-sâ'ga, the ground rattlesnake of the central United States See RATTLESNAKE

MASSÉNA, André, an-drā ma-sā-na, marshal of France. b Leven near Nice, France, 6 May 1758; d. 4 April 1817. In 1775 he entered the French army and after 14 years' service left the army and returned to Nice, where he married During the Revolution he entered a battalion of volunteers, and in 1793 was made general of brigade. In 1794 he took command of the right wing of the French army in Italy, where, at Rivoli and elsewhere, he highly distinguished himself. In 1799 he defeated the Austrian and Russian forces at Zurich, and in 1800, by his defense of Genoa for three months, gave Bonaparte time to strike successfully at Marengo. In 1804 he was created marshal of the empire In 1805 he received the chief command in Italy, where after the Peace of Pres-burg he occupied the kingdom of Naples In 1807 he was given the command of the right wing of the French army in Poland, and soon after received the title of Duke of Rivoli. In 1809 he distinguished himself against the Austrians, and at Esslingen his constancy and firmness saved the French army from total destruction. Napoleon rewarded him with the dignity of Prince of Esslingen. In 1810 he took command of the army in Portugal, and forced Wellington within the lines of Torres Vedras, till want of provisions compelled Masséna to retire. In 1814 he was made a peer by Louis XVIII, and though on the return of the emperor he acknowledged his authority, took emperor ne acknowledged his authority, took no active part in the events of the Hundred Days. Consult his 'Mémoires,' edited by Koch (7 vols, Paris 1848-50); Fitzmaurice, G., 'Massena' (in Royal United Service Association Journal, Vol. LVII, London 1913); Gachat, Edouard, 'Histoire militaire de Masséna' (Paris 1908); Toselli, 'Notice biographique sur Masséna' (Nice 1869).

MASSENA, mã-sē'na, N. Y., village in St. Lawrence County, alt. 207 feet, on the Raquette and Grass rivers, on the New York Central and the Grand Trunk railroads, 35m. NE. of Ogdensburg, and on state and federal highways. It is situated in a rich farming and dairying region, in which the chief crops are potatoes, hay, and apples. The county ships great quantities of milk and cream to the cities, especially New York. The Aluminum Company of America has works here, producing aluminum cable for the transmission of electric current, and aluminum structural shapes. The warehouses, mills, and shops of this plant cover an area of fifty acres. Mica products are also a leading item in the industrial output of the village. Its productive potentialities are connected with the St. Lawrence water-power situation. In 1900 a company was organized to construct a canal leading water from the St. Lawrence into the Grass River, to be carried by that stream back to the St. Lawrence. The canal, dropping 45 feet in a distance of three miles, produces great energy. The Aluminum Company of America uses power generated by this falling current; with completion of the proposed hydroelectric power development in the International Section of the St. Lawrence River, still greater measures

of horsepower will be produced here. Massena came into being as a log cabin settlement in 1792, when A. Fancher put up a sawmill beside the Grass River and named the place after Marshal André Massena (qv.). Ten years later a party of settlers moved in from Vermont. Massena was incorporated as a village in 1886. In 1927 part of Massena town was annexed to Massena village. The town as originally constituted included the villages of Massena Center and Massena Springs, the latter having been at one time a popular resort because of its mineral waters. Points of interest near by are some old Indian burial mounds and the Long Sault Rapids of the St. Lawrence River Massena has a mayor and council. Pop. (1930) 10,637; (1940) 11,328.

MASSENET, Jules Emile Frédéric, zhuî ā-mēl frā-dā-rēk mas-nā', French composer: b. Montaud, France, 12 May 1842; d. Paris, 13 Aug. 1912. He was the youngest of 21 children; his father, a blacksmith, had served in the engineers under Napoleon. After studying at the Paris Conservatoire under Reber, Laurent, Thomas and Savard, he gained the first prize for pianoforte in 1859, the first for fugue, and the Print do Paris do and the Prix de Rome for his cantata, 'David Rizzio, in 1863. He had done some traveling in Italy and Germany before he made his début in Paris at the Opéra Comique in 1868 with 'La Grand-Tante' He was appointed professor of composition at the Conservatoire in 1878 and made a member of the Académie des Beaux Arts. Among his earlier works are 'Poème du Souvenir' (1860); 'Poème d'Avril' and 'Suite d'Orchestre' (1868). His first im-portant work was the opera, 'Don César de portant work was the opera, 'Don Cesar de Bazan' (1872), followed in the same year by 'Les Erinnyes' (a tragedy by Leconte de Lisle) and a sacred drama, 'Marie-Madeleine.' An oratorio, 'Eve,' was performed in 1874; the opera, 'Le Roi de Lahore' in 1877; a sacred legend, 'The Virgin' in 1880; 'Herodiade' (an opera) in Brussels, 1881. 'Manon' appeared in 1883; 'Le Cid' in 1885; 'Esclarmonde,' a romantic opera in 1889; also a large number of nonular melodies, pianoforte pieces, and a of popular melodies, pianoforte pieces, and a series of seven 'Suites d'Orchestre,' including 'Scènes Pittoresques,' (Scènes Alsaciennes,' (Scènes Hongroises,' (Scènes Napolitaines) and 'Scènes de Féerie,' as well as two cantatas, 'Narcisse' and 'Biblis.' He also wrote some entr'actes and stage music for Sardou's dramas the 'Crocodile' and 'Theodora' His opera 'Le Mage' (words by Jean Richepin) and a drame lyrique, adapted from Goethe's 'Werther,' were performed in 1891. 'Thais' 'Werther,' were performed in 1891. 'Thais' was first produced at the Paris Opera 16 March 1894, the libretto having been adapted from the novel by Anatole France; a short one-act piece, 'Le Portrait de Manon,' was performed at the Opéra Comique in the same year, and in 1895 he wrote the music for Jules Claretie's 'La Navarraise. Of his latest works, the opera 'Don Quichotte' was produced in London in May 1912, and his last opera, 'Panurge,' was completed just before his death. His music, always melodious, has been described by critics as being excessively "sugary."

MASSEY, mas'i, Gerald, English poet: b. Gamble Wharf, near Tring, Hertfordshire, 29 May 1828; d. 29 Oct. 1907. He received but little education, and at eight was employed in a silk factory. Going to London about 1843, he

became an errand boy, and in 1849 editor of *The Spirit of Freedom*, a Radical paper, becoming at the same time associated with Kingsley, Maurice and other Christian Socialists In 1854 he published 'Ballad of Babe Christabel,' and other poems. The volume attracted the notice of Landor, and the poems issued in succession to it met with no little popularity.

MASSEY, Hart Almerni, Canadian inventor. b Haldmand, Northumberland County, Ontario, 1823; d. 1897. He received his education at Watertown, N. Y., and Victoria College, Cobourg, Ontario. He assisted in managing his father's farms and while thus engaged set about improving the agricultural implements then in use. His father established a factory at Newcastle of which Hart became sole owner in 1855. He perfected mowing and reaping machines, first of their kind in Canada, and introduced improvements in other farm implements

MASSEY, Raymond, Canadian actor and producer: b. Toronto, Ont, 30 Aug. 1896. He was educated at the University of Toronto and at Oxford; served in the Canadian Field Artillery in Europe in 1915–19; was in instructor in field artillery at Yale and Princeton universities in 1917 and in Siberia in 1918. He made his stage debut in 1922 at Everyman Theatre and entered in the management of this theatre in 1926. Here he produced a number of plays and played a variety of parts. His most conspicuous success was as Abraham Lincoln in 'Abe Lincoln in Illinois' at the Plymouth Theatre, New York, in 1938–39.

MASSICOT. A mineral consisting of monoxide of lead, PbO, containing about 928 per cent of that metal and an ore in many mines in Colorado and Idaho

MASSILLON, Jean Baptiste, zhôn batēst ma-sē-yôn, French preacher: b. Hyères, Provence, 24 June 1663; d Clermont, 18 Sept. 1742. In 1681 he entered the Congregation of the Oratory; then taught theology at Montbrison and Vienne; went to Paris in 1696 as director of the Seminary of Saint Magloire, and won great favor, even at court, by his eloquent and searching sermons His funeral orations are particularly famous. In 1718 he was appointed preacher to Louis XV, then only nine years old, and for him composed the 'Petite Carême,' a notable series of sermons Massillon was elected to the French Academy in 1719; in the same year he retired from Paris to Clermont, where he died of apoplexy His works were edited in 1828 by Guillon and in 1886 by Blampiguan, whose biographical sketch, 'Massillon d'après des Documents inédits' (Paris 1879), should be consulted Consult also de Julleville, Louis Petit, 'Histoire de la langue et de la littérature française' (Paris 1898)

MASSILLON, măs'îl-on, Ohio, city in Stark County, alt. about 1,000 feet, on the Tuscarawas River (not navigable); on the Pennsylvania; Baltimore and Ohio; and Wheeling and Lake Erie raılroads, and on state and federal highways, 100m. in direct line NE. of Columbus. Situated in a region of farm lands and coal deposits, its principal manufactures and industries are special steels, automobile accessories, equipment for conveyance of heat, furnaces, refractories, and fabricated metal products.

City government is administered by a mayor and council. The city has a public library and a modern general hospital. A state hospital for the insane is also located there. The Baldwin Museum, housed in an old town home, has exhibits in science, history, and art. A city landmark is the Jacob S. Coxey house, one time home of the leader of "Coxey's Army" Massillon came into corporate being in 1826, when the Ohio Canal was projected With the opening of the canal between Cleveland and Massillon, the city took its place as a leading grain market. When canals began to give way to the railroads, in the 1850's, Massillon was firmly established as a trading center. Federal projects of the late 1930's included relocation of the river (Tuscarawas) and the railroads The city was named for Father Jean Baptiste Massillon, by Mrs. James Duncan, wife of the founder. Pop (1930) 26,400, (1940) 26,644.

MASSINGBERD, Francis Charles, English clergyman. b Lincolnshire, 1800; d 1872 He received his education at Rugby and at Oxford; took orders, and was appointed rector of South Ormsby in 1825. In 1847 he became prebendary of Lincoln Cathedral, and was made chancellor in 1862. He published 'Reasons for a Session of Convocation' (1833); 'Church Reform' (1837); 'The Educational and Missionary Work of the Church in the Eighteenth Century' (1857); 'History of the Leaders of the English Reformation' (4th ed., 1866), 'The Law of the Church and the Law of the State' (1859); 'Lectures on the Prayer-Book' (1864); 'Sermons on Unity, with an Essay on

Religious Societies (1868).

MASSINGER, mās'in-jer, Philip, English dramatist: b Salisbury, November 1583; d Southwark, London, March 1640. He studied at Saint Alban Hall, Oxford, went to London in 1606, and soon became a well-known playwright. He collaborated with Nathaniel Field, Thomas Dekker, Cyril Tourneur and Robert Daborne, and regularly with Fletcher in 1613-25. Independently, he wrote 15 plavs, including comedies, tragedies and tragi-comedies. They are frequently based closely on Italian and Spanish originals, but show much skilfulness in the development of plot, and a knowledge of the requirements imposed by stage presentation 'Henry VIII' in its present form was probably written by him with Fletcher. Among the plays wholly by him are 'The Bondman' (1624); 'The Roman Actor' (1629); 'A New Way to Pay Old Debts' (1632); 'The Guardian' (1655). 'A New Way to Pay Old Debts' kept the stage in England to the end of the 19th century. There is an edition of his plays by Cunningham (1867); and of 'Selections' by Symon (1887-89) (See New Way to Pay Old Debts' (rev. ed., 1883); Symons, A (ed.), 'Selected Plays' (London 1887-89); 'Transactions of the New Shakespeare Society' (ib. 1880-86); Fleay, 'Biographical History of the English Dramatic (London 1891); 'Cambridge History of English Literature' (Vol VI, Cambridge 1910), Ward, A. W, 'History of English Dramatic Literature to the Death of Queen Anne' (New York 1899).

MASSON, măs'on, David, Scottish critic b. Aberdeen, 2 Dec. 1822; d. Edinburgh, 7 Oct.

1907 He was educated at Marischal College and Edinburgh University; in 1852 was appointed to succeed Clough in the chair of Enghish language and literature at University College, London He was editor of Macmillan's Magazine 1859-68, and was professor of rhetoric and English literature in the University of Edinburgh 1865-95. He is best known for his elaborate and comprehensive study of Milton's life and times (3 vols, 1858-80) — a work valuable alike as a contribution to English history and to the history of English literature Other works by him are British Novelists and their Styles (1859); 'Recent British Philosophy' (1865); 'Drummond of Hawthornden' (1873); 'The Three Devils—Luther's, Milton's and Goethe's' (1874). He also published the Cambridge edition of Milton's Poems with the Cambridge edition of Milton's Poems with introductions, notes, and an essay on Milton's English (3 vols, 1877); the Golden Treasury edition (2 vols, 1874); the Cabinet edition (1890) and the Globe edition (1871); 'De Quincey' in 'English Men of Letters' series (1878); an edition of De Quincey's works (14 vols, 1889-91), and 'Edinburgh Sketches and Memories' (1892) In 1893 he was appointed Memories of the Power for Scotland. He also Historiographer-Royal for Scotland. He also wrote 'Carlyle Personally and in his Writings' 'Edinburgh Sketches and Memories' (1885); (1892)

MASSON, Frédéric, frā-dā-rēk ma-sôn, French historian: b. Asmières, 1847; d. Paris, 19 Feb 1923. He was librarian in the archives of the Foreign Office, and after the overthrow of the empire became secretary to Prince Napoleon, and was entrusted with the arrangement of the Prince's papers and collections. He was the author of nearly 20 volumes in a series of works on Napoleon I. His method is anecdotic, and he based his statements on original documents,—correspondence, account- and notebooks, and the like, many of which he himself owned in his large collection of Napoleonic material. Among the titles of his studies are 'La Révolte de Toulon en prairial an III' (1875); 'L'Impératrice' (1877); 'Le Marquis de Grignan' (1881; 3d ed., 1908) 'Les diplomates de la Révolution' (1884); 'Napoléon et les femmes' (21st ed., 1897); 'Napoléon chez lui' (1894); 'Les cavaliers de Napoléon'; 'Napoléon inconnu' (1895); 'Marie Walewska' (1897); 'Joséphine de Beauharnais, 1763-96' (1899); 'Joséphine répudiée 1809-14' (1901); 'L'Impératrice Marie-Louise' (1902); 'Napoléon et son fils' (1904); 'Napoléon et son fils' (1904); 'Napoléon et sa famille' (9 vols, 1897-1907); 'Le sacre et le couronnement de Napoléon'; 'Autour de Sainte-Hélène' (1908); 'Sur Napoléon' (1909); 'Napoléon à Sainte-Hélène, 1815-21' (1912); 'L'Académie-Française, 1629-1793' (1912); 'Pour l'Empéreur' (1913) In 1903 he was elected to the Académie Française to succeed Gaston Paris and became its secretary. and he based his statements on original documents,- correspondence, accountand note-

MASSON, Louis François Rodrigue, Canadian statesman b. Terrebonne, Ouebec, 1833; d 1903. He received his education at the College of Saint Hyacinthe, province of Quebec, and at Georgetown College, District of Columnia. bia He was admitted to practise law in 1859. In 1867 Mr. Masson was elected to Parliament as a Conservative member from Terrebonne and continued to hold his seat until 1882. He served as Minister of Militia and Defense in 1878-80; became president of the council in the latter year; and in 1884-87 served as lieutenant-governor of Quebec province. He was called to the Senate in 1882 and a second time in 1892. He published 'Le bourgeois de la compagnie du Nord-Ouest' (1889).

MASSON, Thomas Lansing, American editor: b. Essex, Conn, 21 July 1866; d 18 June 1934. He was educated in the public schools of New Haven, Conn., and from 1893 to 1922 was literary and managing editor of Life; associate editor of The Saturday Evening Post 1922-30. His published works include: 'Yankee Navy' (1899); 'A Corner in Women' (1905); 'Short Stories from Life' (1916); 'Well, Why Not?' (1921); 'Our American Humorists' (1922); 'That Silver Lining' (1923); 'Why I Am a Spiritual Vagabond' (1925); 'Tom Masson's Annual' (1923, 24, 25).

MASSOWAH, mas-sow'a, or MAS-SAWA, northeast Africa, a seaport and the principal town of the Italian colony of Eritrea, on a small coral island in the Red Sea, at the northern end of Arkeeko Bay, connected with the mainland by a causeway. The town is built of stone, is defended by several forts, and is supplied with water from the neighboring M'Kulu heights. The town is hot and unhealthful, but the M'Kulu hills have a much better climate. A railway 75 miles long connects with Saati inland and continues to Asmara, the capital 60 miles further inland. The chief imports are grain and flour, cotton manufactures, glass-wares, arms, cutlery, spices, wines and spirits; principal exports, rhinocerous-horns, gold, ivory, honey, pearls, gums, ostrich feathers, skins and wax, brought by caravans from the interior. The pearl and mother of pearl industry (1928) was valued 5,000,000 lire. Formerly dependent on Egypt, the town and strip of coast were ceded to Italy in 1885. Pop about 12,000, including 350 Europeans and about 500 Asiatics.

MASSYS, mäs-sīs'. See Matsys, Quentin.

MASTABA, an Arabic word meaning bench, applied by Egyptologists to certain Egyptian tombs which were common under the Memphite dynasties. Remains of hundreds of these tombs still exist. They are in size from 18 by 26 feet to 85 by 172 feet. They are oblong, bench-like structures, with flat roofs of stone slabs. Constructures, with nat roots of stone states. Consult 'Bulletin of the Metropolitan Museum of Art' (Vol. VIII, New York 1913); Erman, Adolph, 'Life in Ancient Egypt' (New York 1894) and Mariette, A. E., 'Les mastabas de l'ancien empire' (Paris 1881–87).

MASTER OF ARTS (MA. or A.M., artium magister), an academical honor conferred by universities of the United States Great Britain and other countries, upon students after a course of study and a previous examination in the chief branches of a liberal examination in the chief branches of a liberal education, particularly philosophy, philology, mathematics, physics and history. The word magister, connected with a qualifying phrase, was used among the Romans as a title of honor; but its present meaning must be traced to the time of the establishment of the oldest universities. Regularly occarried faculties were universities. Regularly organized faculties were not then known as they now exist in the universities. The whole circle of academic activity

was limited to the seven liberal arts (see ART); and they who received public honors on the completion of their course of studies, for their diligence and knowledge, and had already received the degree of baccalaureus (bachelor), were called magistri artium (masters of the liberal arts). In American and English universities this degree follows that of bachelor. The degree of master of arts is inferior to that of doctor of letters (DLitt) German universities the title was formerly conferred, but has been superseded by that of doctor of philosophy (PhD.), which practically corresponds to the degree of MA. in other universities. This title is an indispensable preliminary to the attainment of the position of docent in the German universities, that is, one who has obtained the right to deliver academical lectures See Academic Degrees; Costume, Academic; University

MASTER OF BALLANTRAE, băl-antrā, The, a novel by Robert Louis Stevenson, published in 1889. It is a Scottish romance of the 18th century, beginning with the Stuart uprising of 1745. It is a sombre tragedy of the enmity of two brothers, of whom the elder, James Durrie the Master, takes the side of the Stuarts, the younger, Henry, that of King George.

MASTER BUILDER, The. The tendency toward symbolism, to be observed in the early romantic works of Ibsen, and occasionally in his dramas of social awakening, becomes dominant in 'The Master Builder' ('Bygmester Solness'), published in 1892 and played the next season. Already in 'The Wild Duck' and 'The Lady from the Sea,' Ibsen had mingled symbolism with naturalism; but only in 'The Master Builder' does the hidden allegory threaten to warp his surface story out of consistency. The piece, which begins with matter-of-fact scenes and situations from middle-class life, ere long develops into a tenuous fable that suggests much more than it presents.

As a drama of ideas 'The Master Builder' emphasizes two notions: the peril of selfish individualism, already shown in 'Rosmersholm' and 'Hedda Gabler'; and the struggle of age against youth. Ibsen, conscious of his advancing years, felt the inevitable passing of power from the older to the younger generation He felt, also, not only the fear of youth, but its fascination, especially in his innocent affair with Emilie Bardach, a girl of 18 whom he, at the age of 61, had met in the Tyrol during the summer of 1889, and with whom he later corresponded. He has universalized these merely personal sentiments, setting forth the problem of every man who lives long enough to regret what is gone and to strive desperately to hold what is slipping from him. This particular conflict Ibsen associates with the still larger conflict between individualism and altruism.

Solness, the master builder, has achieved success at the expense of his wife and his business associates. He has checked the rise of old Knut Brovik, and refused to young Ragnar Brovik permission to build independently. He has employed the latter's sweetheart and captured her affections only as a ruse by which to retain Ragnar's services. Obsessed,

as he admits, with dread of the younger generation, yet thinking himself at last secure from it, he succumbs when the younger generation knocks at his door in the person of Hilda Wangel. Hilda, who had already appeared in a minor rôle in 'The Lady from the Sea,' is a strange and wilful maiden who induces Solness to relax his selfish schemes, and, at the same time, to attempt to mount, as he once was wont, to the top of a lofty tower He can no longer safely climb to such heights, and yet, inspired by Hilda's faith, he makes the attempt, only to fall. Though he forfeits life, Hilda professes satisfaction, inasmuch as, when Hilda professes satisfaction, masmuch as, when he stood at the dizzy summit, she has heard harps in the air. Hilda is the puzzle of the play, an influence for both good and evil, a symbol of youthful aspiration, or perhaps of youth as the enemy of age and of woman as the enemy of man. The charm of the drama lies in its tantalizing hints of concealed significances; its defect lies in its lack of proper icances; its defect lies in its lack of proper correspondence between the human action and the allegory Much in the later portions of the work is scarcely intelligible as a natural representation of life (The Master Builder) has been translated by Edmund Gosse and William Archer (1893). It is discussed in the monographs on Ibsen by Otto Heller (1912), Jennette B Lee (1907), M J Moses (1908), and Henry Rose (1908), and, by P. H Grummann, in 'Nebraska University Studies' (1910) FRANK W. CHANDLER

MASTER OF THE HORSE, an official having charge of the horses, hounds, etc, of a sovereign, as of England He is there a member of the ministry and the third dignitary of the court The office is appointive, and he has the use of the royal horses and servants. The office formerly existed in Germany and France.

MASTER OF THE ROLLS, a member of the Supreme Court of Judicature in England, who presides with the lords justices in the Court of Appeal, and ranks next to the Lord Chief Justice. He is the keeper of all records of the Court of Chancery and of the rolls of all grants and patents that pass under the great Seal. By the Supreme Court of Judicature Act of 1873, he was denied the privilege he formerly had of a seat in the House of Commons.

MASTER AND SERVANT. See FAMILY LAW.

MASTER SINGERS. See MEISTERSINGERS.

MASTER SINGERS. See MEISTERSINGERS.

MASTERS, Edgar Lee, American lawyer and writer: b. Garnett, Kan. 23 Aug. 1869. He studied at Knox College, Illinois, and was admitted to the bar in 1891. His publications include 'A Book of Verses' (1898); 'Maximilian,' a drama in blank verse (1902); 'Blood of the Prophets' (1905); 'The Trifler', a play (1908); 'Spoon River Anthology' (1915); 'Songs and Satires' (1916); 'Starved Rock,' poems (1919); 'Mitch Miller' (1920); 'Doomesday Book' (1920); 'The Open Sea' (1921); 'The Nuptial Flight' (1923); 'The New Spoon River' (1924); 'Selected Poems' (1925); 'Lee,' a dramatic poem (1926) 'The Fate of the Jury' (1929). His 'Spoon River Anthology' is his best known work. It is a collection of epitaphs, written in vigor-It is a collection of epitaphs, written in vigorous style, and pervaded by a materialism

that shocks and surprises. Despite its obvious limitations, its naive force has won many readers and much favorable comment Consult Lowell, Amy, 'Tendencies in Modern American Poetry' (New York 1917).

MASTERWORT, the rustic name of several umbelliferous plants, as those of the genus Anethum (see DILL), formerly much cultivated as pot-herbs, and held in great repute as a stomachic, sudorific, diuretic, etc

MASTIC GUM, or MASTICHE, a resinous substance flowing from deep incisions made in the branches of the Pustachia lentiscus, a shrub of the terebinth family growing in the countries bordering on the eastern Mediterranean This tree attains the height of 15 or 20 feet; the leaves are alternate and pinnate; the flowers are small, inconspicuous, disposed in axillary racemes, and are succeeded by an ovoid drupe containing an osseous nut. It forms one of the most important products of Scio, and other Ægean islands, where it has been cultivated from remote antiquity. Heat seems to exercise a great influence on the resinous product. Mastic is consumed as a chewing-gum in vast quantities throughout the Turkish Empire by women of all classes, for the purpose of cleansing the teeth and imparting an agreeable odor to the breath. It is related to myrrh, frankincense, etc., and was formerly in repute as a medicine throughout Europe, but at the present time is chiefly useful in the arts as a varnish for maps, drawings, etc. Dentists employ it as a filler for cavities.

MASTICATION, or CHEWING, the thorough subdivision of food in the mouth so that it can be readily acted upon by the gastric juice and other digestive secretions. The tongue, cheeks and lips push the food material between the teeth, and by the lateral and upand-down motions of the lower jaw it is cut and torn by the incisor, canine and bicuspid teeth and brused by the molecular or grinding. teeth and bruised by the molar or grinding teeth. During these actions the food is softened by the saliva (insalivation), which exudes abundantly from the salivary glands by the act of mastication. Typical mastication is seen only in the higher vertebrata. «The amphibien holts its fly the high its foot and the phibian bolts its fly, the bird its grain, and the fish its brother without the ceremony of chewing," but in man and the higher animals mastication is necessary for complete and comfortable digestion. Thorough comminution of food by mastication is analogous to the pulverizing process employed by the chemist, but associated with mastication is insalivation, as it is almost impossible to swallow substances which are very dry. Imperfect mastication of food, either by reason of rapid swallowing (bolting), or because of the absence of sound and serviceable teeth, is very frequently the cause of the numerous ailments classified under the term indigestion. Exaggerated mastication which has been so highly recommended by certain persons as almost to constitute a paracea or com-plete prophylaxis is known to lessen the secretion of gastric juices which is started by sensations of taste, to protract beyond desirable limits the time required for proper gastric digestion, to develop the salivary deposit in a proportion relatively too great when compared with the secretion of the pancreas. It is moreover known that the teeth are likely to wear out too soon, if mastication is carried beyond a reasonable time.

Exaggerated mastication and the fancied advantages accruing from it are an illustration of an indulgence in a form of securing the gratification of an unconscious desire. In infancy a great pleasure is derived merely from mouthing different objects, a pleasure originating in the mode of absorbing the early meals at the mother's breast It has been discovered by studying the unconscious wishes of mankind that the sexual desire in the adult is a synthesis of different partial desires which in the infant are satisfied in different parts of the body, now here, now there, but which in the adult are assembled in the genital organs or are at least unified under the supremacy of the genitals. But it has been definitely proven that in some individuals this synthesis has never been successfully accomplished. Either the mouth pleasure zones or the anal or the skin or some other zone which gave in infancy a quite absorbing sense of gratification has failed of appropriate subordination, and has persisted into adult life, with some individuals, as a source of extraordinary pleasure. To this class of partially undeveloped minds belong not only the advocates of exaggerated mastication but all other persons who develop any other form of activity as a fad such that they are noticeably peculiar in that respect.

MASTIFF, a breed of dogs of great size, recognized by the large head, the dependent lips, the broad, hanging ears, and by the general muscularity of the form. The mastiff in general disposition is affectionate and gentle, extremely faithful and vigilant. In Rome and in classical ages these dogs were held in high estimation for their strength and courage. The most valued breeds were obtained from Great Britain, where these dogs originated, and were used to guard flocks and herds; and watching has become instinctive with them. Roman officers were appointed to breed them and to transmit them periodically to Rome, where they fought lions, etc, in the arenas of the Roman amphitheatres and were otherwise favorites. The dog now is highly valued, both as a watchdog, and as a domestic companion. Fawn is the prevalent color, and the weight should be about 165 pounds.

MASTIGOPHORA, a class of Protozoa «in which the flagellate form is prominent although the amœboid and encysted conditions frequently occur." Typical forms are contained in the order Flagellata (q.v.).

MASTODON, a genus of fossil proboscidians of the elephant family, whose remains are found in all parts of the world in Tertiary formations from Miocene time onward to the dawn of the present era. Although in size and external appearance the larger mastodons much resembled modern elephants, save that, like the mammoths, the northern species were probably clothed with long hair, they differed widely from other genera of the family in details of structure, especially those affecting dentition. Thus milk-molars were present, and sometimes were persistent; and in their structure the fossil molar teeth are not penetrated by deep partitions of cement, and their crowns are marked by few (3 to 5) transverse ridges,

which are often broken into nipple-like protuberances. This is, in short, the simplest form of tooth-structure in the family, of which the mastodons are the oldest and most primitive type, and nearest to the earlier Dinotheria. The tusks curved upward only slightly; and then length in Mastodon americanus, whose remains have been obtained nearly entire from bog-deposits in various parts of the United States, was about nine feet, indicating, as do the measurements of the skeleton, an animal about equal in average height to the modern Indian elephant, but with a rather more bulky body and a flatter forehead Of this species, which was a belated survival of an ancient Old World type that became extinct in the Pliocene, several good skeletons are preserved in the museums of the United States and Canada, and certain European species are also well known. About 30 different kinds of mastodons have been described from bones found in almost every country in the world. In the Pliocene works of Texas, Nebraska and Idaho are found remains of a proboscidian (Stegodon) which was a connecting link between the mastodons and the elephants. What brought this widespread group to an end is not clear. was no diminution in their food, which consisted of herbage, bark and leaves, as is known from undigested stomach-contents found within the skeletons; and they survived the historic vicissitudes of climates until subsequently the present settled conditions arrived. There is good reason to believe that they lasted in America, at least, until after the advent of mankind, but indisputable evidence of this is lacking.

Consult Woodward, 'Vertebrate Palæontology' (1898); Lucas, 'Animals before Man in North America' (1902); Scott, 'Land Mammals of the Western Hemisphere' (New York

1913).

MASTODONSAURUS, a fossil labyrinthodont batrachian found in the Triassic formations of England, Wurttemberg and India. It is the largest type known, the head having a length of four feet with a body extending to a length of 10 feet.

MASTURBATION. The limited, restricted dictionary definition is self-abuse, that is, genital manipulation by the hands, clothing, bed clothes, by riding, by hard objects and by pressure of things against the genitals, etc. Regarded in its broader aspect of an autoerotic reaction to external reality it covers a multitude of activities not ordinarily realized as masturbatory in nature and is one of the most important topics in the whole realm of psychopathology. Thus broadly defined it is any erogenous satisfaction through any and all modes of gratification carried on for their own pleasure and includes both somatic and psychic masturbation. Not regarded in antiquity as of very vital importance it was brought into prominence and called deleterious principally by Tissot, who wrote early in the 19th century, and is the sponsor of all the lurid literature which has spread over two continents since his time. He taught that masturbation was a very serious weakness and that it led to various forms of illness and insanity, statements for which modern medical science can find no satisfactory proofs. The most modern

attitude toward masturbation is that the deleterious effects so often observed in those who practise it come not from any injury to the body but from the guilty feelings of those who abuse themselves and from the tendency it has to remove them from the true relations with their fellows That is, when the individual satisfies his fantasy sense of potency by any form of masturbation, the personality will regress to more and more infantile levels and the discrepancy between the social value of the autoerotic behavior and the true adult behavior which is called for by the environment will result in some form of mental or bodily illness The fate of Sodom and Gomorrah revealed its dangers, and the Greeks gave it a poetical con-ception in the myth of Narcissus (see Narcis-SISM), the youth who fell in love with his image in a pool, a story which represents external reality reduced by autoerotism to a mere reflection of self. Thus the forms of physical activity which may be regarded as essentially masturbatory in character are very numerous

Any act which satisfies the unconscious desires through producing an effect upon the body instead of on the world of external reality is of this nature And the body has various zones other than the genital in which this self-gratification is practised unconsciously through multifarious forms of activity, the most prominent being the mouth, the intestines and different parts of the skin. The infant naturally puts everything into its mouth, and this habit is continued into adult life by persons who put things into their mouths for other reasons than merely masticating them and swallowing them as food In fact all objects, not food, that are mouthed serve this purpose, including tobacco, chewing gum, toothpicks, etc., and therefore are subject to the same reproach as any other use of any part of the body through which no change, having a social value, is effected upon external reality. The skin as well as the muscles are used as sources of self-gratification, too, in massage; and such acts as stroking the skin, running fingers through the hair, scratching,

tickling, etc., are other examples.

Constipation of the spastic type is the most common form of unconscious masturbation of the anal-erotic zone Bodily masturbation, conscious as well as unconscious, is paralleled by a form of thinking that may be called mental masturbation, in which the individual, male or female, has acquired the habit, whether or not from practising physical masturbation, of seeking pleasure from his own states of mind. Excessive day-dreaming, reading of light literature and attendance on light drama or moving picture shows, aimless driving about in automobiles and most other forms of solitary or unproductive mental activity may be classed as types of mental masturbation, and when carried beyond a certain degree generally result in a species of mental impotence, in which the individual is unable to carry out any activity to a productive conclusion The treatment of both mental and physical masturbation is mental. The patient is to be shown through selfanalysis just what he is doing, both in its physical and psychical aspects, and that his action is essentially infantile, representing an arrest of development at a very early level, which thus never permits him to act the true adult part in

life. Various wholesome and truly social activities should be encouraged, and the patient instructed how to enlist his entire libido (qv) in them, and the desire for solitary pleasure will gradually disappear.

SMITH ELY JELLIFFE

MASUDI (ABU-L HASAN 'ALI IBN HUSAIN IBN 'ALI UL-MAS'UDI), Arabic geographer and historian b. Bagdad, near the close of the 9th century; d. Fostat, about 956 AD. Receiving a good education he set out to study the history, manner of life, and customs of every land at first hand. This quest took him to Persia and Kerman, in 915 to Istakhr, to Multan and Mansura in 916 From there he journeyed to Cambay, Saimur and Ceylon, to Madagascar and back via Oman He also visited the shores of the Caspian; journeyed to Tiberias in Palestime. He visited Antioch in 943 and Damascus in 945 The last decade of his life was spent in Equational last decade of his life was spent in Egypt and Syria Of the Mo'tazilite sect, he was free from bigotry, studied Christianity and Judaism and was well versed in the history of the principal nations of both Orient and Occident. He wrote a universal history in 30 volumes, entitled Kitab akhbar uz-Zaman, followed by a supplement in Kitab ul-Ausat, a chronology of general history The two works were combined by the author in Muruj udh-Dhahab wa ma'adın ul-Jawahır (Meadows of Gold and Mines of Precious Stones) in 947. Editions have been published at Bulak (1866) and at Cairo (1886). The original with French translation by C. B. de Maynard and P de Courteille has appeared, 9 vols. (Paris 1861-77; vol. 1, in English by A. Sprenger, London 1841). An enlarged edition of this work finished by Masudi in 956 appears to be now lost. Another work, written in 956, is Kitab ut-Tanbih and Ishraf (Rook of Indicator and Paris 2011). wal Ishraf (Book of Indication and Revision) is a summary with corrections of his other writings. It was edited by M. J. de Goeje (Leyden 1894) and there is a French translation by Carra de Vaux (Paris 1896) and a partial translation of m De Saaj's memoir to Meynard's edition of Muruj Consult Brockelmann, Karl, Geschichte der arabischen Literatur, vol. 1 (Weimar 1899); Field, C., Tales of the Caliphs (1909); Nicholson, R A, Literary History of the Arabs (Cambridge 1907) 1907).

MASULIPATAM, or BANDAR, British India, capital of the district of Kistna, Madras, situated at the mouth of the Kistna, on the Bay of Bengal. It was the earliest English settlement on the Coromandel coast, an agency being established there in 1611. Subsequently the town was held for some years by the French; it was taken by storm by Forde in 1759. A storm wave nundated the town in 1864, and about 30,000 lives were lost. Weaving, bleaching and cloth printing are the principal industries, but do not enjoy their former importance. Noble College is the chief educational institution. The port is merely a roadstead in which vessels anchor five miles off shore Masulipatam is reached by a branch of the Southern Mahratta Railway from Bezwada. Pop. (1941) 59,146.

MASURIAN LAKES, Battle of. See WAR, EUROPEAN, Eastern Front.

MA'T, the Egyptian goddess of justice and truth. She was usually represented as wearing an

ostrich feather on her head, with eyes bandaged as a sign of her impartiality. Judges and kings were at all periods her professed worshippers. The father of the goddess was Rê, the sun god Her Greek compeer was Themis. Consult Budge, A E. T. W., The Gods of the Egyptians, vol 1, (London 1904) and Wiedemann, Alfred, Religion of the Ancient Egyptians (New York 1897).

MATA HARI, ma'ta ha're (real name Gertrud Margarete Zelle), Dutch dancer and courtesan: b. Leeuwarden, Netherlands, Aug. 7, 1876; executed by the French as a spy at Vincennes, France, Oct. 15, 1917. The convent-bred daughter of a Dutch business man, Gertrud Zelle at 18 married an elderly profligate, Capt. Campbell MacLeod, of Scottish descent and commissioned in the Dutch Colonial Army. Soon after their marriage, a son was born in Amsterdam where the couple lived in a fashionable quarter. The husband's gambling debts threat-ening ruin, she initiated her career of an adventuress by blackmailing a rich admirer. Another child, a daughter, was born before they sailed for Java where the captain commanded a battalion of the Colonial Army Reserve. From the outset the marriage was a miserable failure, and on their return to Holland Mrs. MacLeod instituted divorce proceedings. The courts denied the application but later granted her husband a decree In 1903 she went to Paris, ambitious to become a dancer. While training for this profession, she earned money as an artists' model, and in other ways During the decade preceding World War I, she gained notoriety on the vaudeville stages of Paris, Berlin, Vienna, Rome, and London. But she preferred to give private performances of her erotic dances, supposedly of symbolic religious significance, before select gatherings of persons in the upper political and social circles. Thus she came to know men who were prominent in the government and established intimate relations with them. Her middle-class Dutch origin lacking glamour, she represented herself as having been born on the Malabar coast of southern India, the daughter of a dancing gırl who dıed in giving her birth. Named Mata Hari, meaning Child of the Dawn, she was brought up in a Brahman temple dedicated to Siva, the god of evil, and became one of his votaries. Tall, slm, and beautifully formed, with sombre eyes, black hair and amber skin, she easily convinced admirers of her Hindu pedigree, although the only Asiatic heredity she could truthfully claim was a strain of Semitic blood in the paternal line. Several years before the war she attended the German espionage school at Lorrach. In 1914, on the day war was declared she rode through the streets of the German capital with Berlin's chief of police. A citizen of a neutral country with property in France, she was able to return to France in 1915 despite the war. On this occasion she changed her role of an Oriental dancer to that of a rich woman of fashion. Before her arrival the French secret service had full reports on her both from its own agents and from the Italian secret service. They knew her relations with the Berlin police chief, the German crown prince, and other Reich officials. But lacking direct evidence they were unable to establish absolute proof of her criminality. Furthermore, among her protectors were men high in both the French and Dutch governments. For months she skillfully avoided

the numerous traps laid for her by the French Deuxieme Bureau Finally she was arrested in a Paris hotel on Feb. 13, 1917, the day after her return from Madrid where she had been observed in frequent conferences with the heads of the German military and naval intelligence services. The evidence proving her a spy which had been accumulated over many years was at last incontrovertible. One of the most damning documents was an intercepted telegram from German Army headquarters to the embassy in Madrid instructing H21 (her code number in the German secret service) to return to Paris where 15,000 pesetas would be delivered to her. The check was found on her after her arrest. Another proof was her acceptance of 30,000 marks from the German secret service before her return to France in 1915. Her relations with French, British, and Russian officers, particularly of the flying services, had enabled her to obtain much valuable military information which she was able to forward to the Germans through seemingly innocent letters to her daughter conveyed by the Dutch diplomatic pouch from Paris. At her trial it was estimated that her espionage activities had been responsible for the death of at least 50,000 Allied soldiers. She faced a firing squad at Vincennes with surprising fortitude for a woman whose life had been a long career of debauchery. Consult: Coulson, Thomas, Mata Harr Courte-son and Spy (New York 1930); Morain, Alfred, "The Case of a Spy—Mata Hari" in Underworld of Paris (New York 1931).

MATABELELAND, ma-tä-bē'lĕ-lănd, a region in Southern Rhodesia, Union of South Africa, between the Limpopo and Zambesi, north of the Transvaal. In 1889 it came under the administration of the British South Africa Company, against whom the natives unsuccessfully rebelled in 1893 and 1896. The Matabeli are a warlike Kaffir race, who migrated from Natal in 1827 under their chief, Umsilikatse. The country is traversed by ranges of hills—the Matoppo Hills being the chief—is watered by numerous streams. On Sept. 12, 1923, it became part of Southern Rhodesia when that country became part of the British Empire. Buluwayo is the chief town. Other towns are Girelo and Selukwe. Pop. (1936) 1,899 whites and 263,857 natives. The Cape to Cairo Railroad passes through Buluwayo, which is 1,360 miles distant from Cape Town. Consult: Oates, Frank, Matabele Land and the Victoria Falls (London 1881); Montague, Interior of Central Africa (London 1886); Wills and Collingridge, The Downfall of Lobengula (London 1894); Norris, Matabeleland (London 1895); Baden-Powell, The Matabele Campaign, 2d. ed. (London 1901).

MATACHIN, mat a chen', or MATACHINE, "the dance of fools," a former well-known comic dance performed by maskers in mock-military guise. It was common in France and Italy. The dance itself was merely a display of tumbling or acrobatic feats.

MATACO, a South American Indian stock, including several tribes, whose habitat is in the Vermejo River Valley in the Gran Chaco, in northern Argentina. They are of medium size with wavy hair and subsist by hunting, fishing, and cattle raising. Their dress is made of skins and they dwell in huts of brush. Consult Brin-

ton, D. G, Linguistic Cartography of the Chaco Region (Philadelphia 1898), Anales de la Sociedad Científica Argentina (Buenos Aires 1904); Schuller, Sobre el origen de los charruás (Santiago 1906).

MATADOR, in Spanish bullfights the man appointed to administer the fatal stroke to the bull. See Bull-Fight.

MATAGALPA, ma-tá-gal'pä, Nicaragua, town, capital of the Department of Matagalpa, north of the central part of Nicaragua. It is situated in a fertile agricultural region, in which the chief products are tobacco, coffee, and sugar. The lack of railroads has been a hindrance to the growth of the towns, but a good highway is under construction to connect it with Managua, the capital, and other cities. The inhabitants are mostly Indians. Pop. (1940 est.) 8,506.

MATAMOROS, Mariano, mā-rē-ā'nō mata-mō'rōs, Mexican patriot. b Mexico, about 1770, d. Valladolid, Feb. 3, 1814 He first appears in 1810 as substitute priest of the parish m Jantelolco, a village south of Mexico City. In 1811 he identified himself with the revolt of Hidalgo (q.v.), and became the principal commander under Morelos (q.v.). He attained the rank of lieutenant general on April 19, 1813. On Oct. 14, 1813, he gained the victory of San Augustin del Palmar, and on Jan. 5, 1814, was captured at the defeat of Puruarán. He was executed in Valladolid market place. The town of Matamoros, on the United States frontier, was named in memory of this sterling patriot.

MATAMOROS, Mexico, a frontier town and river port opposite Brownsville, Texas, in Tamaulipas, on the right bank of the Rio Grande del Norte, about 30 miles above its mouth in the Gulf of Mexico It consists chiefly of brick houses; around the public square stand the church, townhouse, customhouse, and a number of elegant private dwellings. A considerable trade is carried on with the United States; horses, hides, wool, and cottonseeds are exported, and manufactured goods imported. In normal years its commerce is valued at about \$4,000,000. During the Mexican War in 1846 the town was occupied by American troops under General Taylor, on May 18. Pop. (1940) 15,699.

MATANE, ma'tán, Canada, town in Matane County, Province of Quebec, on the Canadian National Railroad Steamers ply between it and Montreal and Gaspé. The town has large sawmills and extensive lumber interests. Matane is in a good hunting and fishing region. Pop. (1941) 4,633.

MATANUSKA RIVER, an affluent of Knik Arm, Cook Inlet, Alaska. The valley of this stream has extensive coal deposits which have been the subject of federal legislation in recent years. See Alaska, and consult Martin, "Matanuska Coal Field" (United States Geological Survey), Bulletin 239), and "Railway Routes in Alaska," Document 1346, House of Representatives, 62d Congress, 3d session.

MATANZAS, mă-tăn'zas (Sp. mä-tân'thâs). Cuba, a seaport city on the north coast, capital of Matanzas province, 52 miles by rail east of Havana. It is situated on Matanzas Bay, one of the largest, safest, and most convenient harbors of the Western Hemisphere. The city is well built with wide, regular and paved streets, handsome plazas and public buildings, and good railway communications. The caves of Bellamar and Yumuri Valley, in the neighborhood, are two popular natural resorts. Mantanzas ranks in importance next to Havana in the export of sugar, molasses, rum, and coffee The crop and price of sugar is the barometer of prosperity. It has several mills, distilleries, oil refineries, tanneries, shoe factories, and machine shops. It was founded in 1693, and suffered from piratical incursions during the first century of its existence. The city was bombarded by the United States warships during the Spanish-American War in 1898, the only casualty, widely telegraphed, being an injury to a "Matanzas mule," which made the animal famous Pop. (1938), 72,826.

MATAPAN, ma-tà-pan', Cape. See CAPE MATAPAN.

MATAS, Rudolph, American surgeon: b. Bonnet Carre, near New Orleans, La, Sept. 12, 1860. He was educated at Barcelona, Spain; Paris, France, Brownville, Texas; Soule's College, New Orleans; Saint John's Literary Institute, Matamoros, Mex., and at Tulane University. After his graduation he practiced in New Orleans, where since 1895 he specialized in surgery. In the latter year also he was appointed to the chair of surgery at Tulane University. Dr. Matas was senior surgeon of Touro Infirmary and senior visiting surgeon at the Charity Hospital. In 1917 he was commissioned major in the medical reserve corps of the United States Army, was president of the American Surgical Association in 1910; of the Southern Surgical and Gynecological Association in 1911, and vice president of the American Society of Clinical Surgery in 1908–1910 and of the American College of Surgeons in 1913. From 1883 to 1895 he edited the New Orleans Medical and Surgical Journal. He is the author of many treatises and monographs on surgical subjects and a frequent contributor to medical journals and textbooks.

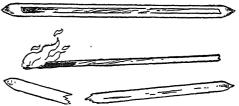
MATCH INDUSTRY. It was in 1669 that the Hamburg alchemist, Hennig Brand (Brandt) discovered phosphorus while experimenting with an olio he hoped he could reduce to gold. But while phophorus was soon used in several briefly popular fire-producing forms, it was not adapted to the manufacture of matches

for about 160 years.

In 1680 both Godfrey Haukwitz and Robert Boyle sold coarse sheets of paper coated with phosphorus in combination with splinters of wood tipped with sulphur. When the splinters were drawn through a fold of the paper they burst into flame. Since the price of an ounce of phophorus in those days was the equivalent of \$250 today, the clientele for these early matches was limited to the extremely wealthy, and when their interest in the novelty ebbed, both sales and experiments ceased.

Disinterest in phosphorus continued for a century, during which the world continued to rely chiefly upon flint and steel for sparks to be nursed into the fires it needed for warmth, cooking, and manufacture. Then, in 1781, began a cycle of inventiveness which was to produce modern matches.

The first of these inventions was the *Phosphoric Candle* or *Ethereal Match* which appeared in France in that year. It consisted of paper tipped with phosphorus, sealed in a glass tube. Admission of air when the glass was broken set the paper to flaming The *Pocket Luminary* (Italy, 1786) was a small bottle lined with oxide of phosphorus. Sulphur-tipped wood splints ignited when rubbed on this coating and withdrawn. The *Instantaneous Light Box*, invented in 1805, was highly popular with American gentlemen up to the time of the Mexican War, despite obvious dangers. Like the Luminary, it involved a small bottle, this one filled with sulphuric acid. The splints, treated with a composition of potassium chlorate, sugar, and gum arabic, were called *Empyrion or Oxymuriated Matches* in the United States and retailed for \$2 for 50 together with the "box."



The Ethereal Match (1781) comprised of paper, tipped with phosphorus and sealed in a glass tube.

The last of these elaborate early matches was the *Electropneumatic Fire Producer*, involving the principle of the ignition of a fine jet of hydrogen gas by a spark from charged rosm. The German chemist, Johann W. Dobereiner, produced several types He created gas by the action of sulphuric acid on zinc and directed it in a thin stream upon a platinum sponge in contact with the air. Several of Dobereiner's models still survive in museums.

Even after the birth of the match in its original modern form in 1827, inventors continued to contrive unusual means of producing fire. Self-lighting cigars of two types were introduced in Austria in 1839. In some of these a short splint of wood with a matchhead decorated with rosettes of linen was inserted in the tips. When the cigar was struck, the smoker inhaled a combination of the fumes of match composition, burning wood and linen, but he had a light. Another type wore a frilly cap of treated paper much like the lacy "socks" placed on lamb chops in some restaurants. Pellet matches (1850) made of sawdust, flour, and match composition were exploded by a plunger machine carried by users. Another pellet match came in strips like caps for a Fourth of July pistol and when detonated set fire to the paper holding them. Wire Fixed Stars, Chinese Lights, Prussian War Fusees, and Latchford's Bone Stem Cigar Lights Which Will Never Fall Off, Break Or Burn The Fingers In Using, are the names of some of the novel lights appearing in the 1860's.

As late as 1882, the Diamond Match Com-

As late as 1882, the Diamond Match Company bought the patent for the Drunkard's Match, the splint of which was treated chemically so that it would not burn beyond midpoint. This match was highly popular with American bon vivants for twenty years. Much later the match inventors produced the repeatedly ignitible or everlasting match. In 1932, Rudolf Koenig and Zoltan Foldi, Austrian chemists, patented a

repeatedly ignitible rod resembling a styptic pencil wrapped in Cellophane. Actually it was an elongated match head, loaded with fire retardents to make it burn more slowly. Each of these matches was good for 40 lights if carefully nursed, and packets of three were sold in Europe for approximately 5 cents. Tried out in Holland, these repeatedly ignitible rods proved unsuccessful commercially.

The Friction Match.-While Döbereiner was still manufacturing his elaborate Fire Producers, the first friction match had already been made and sold in England (1827) The records of an apothecary, John Walker of Stockton-on-Tees, show that he sold to a Mr. Hixon "100 Sulphurata Hyperoxygeneta Frict" Later analy-sis indicated that Walker's friction matches were tipped with antimony sulphide, potassium chlorate, gum, and starch. They were three inches long and were ignited by drawing them through a pleat of "glass paper." Two years later when Wallow with the transfer of the property of the p later when Walker exhibited his matches to amazed Londoners, one of the spectators, Samuel Jones, was not too excited to note there was no protecting patent and he promptly set himself up in the match business Jones named his



Samuel Jones' Lucifers appeared in London in 1829 and smelled so badly he warned users to avoid the

matches Lucifers Their ignition was accompanied by a series of small showers of sparks and odors so offensive that this warning was printed on their boxes: "If possible, avoid inhaling gas that escapes from the combustion of the black composition. Persons whose lungs are delicate should by no means use Lucifers.

In 1830, about 160 years after its discovery, phosphorus was adapted by Dr. Charles Sauria of France as an ingredient for match heads. Sauria substituted it for antimony sulphide in the Walker formula and in so doing improved the efficiency of matches but set off a wave of necrosis which was to exact a fearful toll of life among match makers and users for 80 years. Necrosis, called "phossy jaw" by workers, attacked the bones, particularly of the jaws and resulted in maining or death. In addition, innocent persons, babies especially, were poisoned by ingesting match heads containing phosphorus, and they furnished a widespread and easily available source of poison for suicide and even murder.

This dreadful occupational hazard plagued American factories until 1911 when William A. Fairburn of the Diamond Match Company adapted harmless sesquisulphide of phosphorus to United States climatic conditions. The new nonpoisonous formula was presented to the government for the use of all rival companies, a humanitarian gesture which won public com-mendation from President William Howard Taft and for which Mr. Fairburn and his com-

pany were given the Louis Livingston Seaman Medal "for the elimination of occupational disease.

Substitution of sesquisulphide of phosphorus in the formula accomplished other things It raised the point of ignition more than 100 degrees, a considerable safety factor, and it ended fires caused by rodents Experiments conducted by Mr. Fairburn proved conclusively that while rats and mice would gnaw on phosphorus matches, thus igniting them sometimes, they would not touch the new match heads even when starving.

Manufacture of the dangerous phosphorus matches began in the United States in 1836 when Alonzo Dwight Phillips, a Springfield, Mass powder maker, secured a patent for "new and useful improvements in modes of manufacturing friction matches for instantaneous light" Phillips made his phosphorus matches by hand and when he had a wagon load, sold them himself from door to door thus founding an industry which now produces about 500 billion matches each year in the United States

At that time, only one type of match existed, the wooden strike-anywhere that is sometimes called the "kitchen" match today. The discovery of red or amorphous phosphorus by Professor Anton von Schrotter in 1845 led to the development of another type of match, the safety, by J. E Lundstrom 10 years later. The safety match differs from the strike-anywhere only in one regard: part of the ingredients necessary to create fire are in the head of the safety match, part in the striking surface on the

The third basic form of modern match, the paper book variety, was the invention in 1892 of an attorney, Joshua Pussey. His books conof an attorney, Joshua Fussey. Fits books contained 50 matches, had the striking surface on the inside where sparks frequently ignited the remaining matches, a danger quickly corrected by the Diamond Match Company which bought the patent in 1895. Unpopular at first and made by hand, book matches became big business in 1896, when a brewing company ordered 10. 1896 when a brewing company ordered 10,-000,000 books to advertise their brews, forcing creation of machinery for swift production in volume. Today the industry manufactures 200 billion book matches annually in the United States with about 196 billion being handed out free to customers of cigar stores, hotels, restaurants and railroads, a practice unknown in any other country.

At the time of the Phillips patent, matches all over the world were made by hand on a piecework basis in the homes of the poor, a condition which led to the infection by necrosis of a considerable segment of the populations in industrial areas. The boxes also were made by hand in homes. The first American patent for a machine to cut round splints was granted to Chauncey E. Warner in 1841.

The trend toward mechanization of the industry and the centralization of efforts in factories instead of homes began in 1842 with the invention of a machine by Reuben Partridge, which cut the wooden splints in bulk, ending tedious hand methods for this important process. Other inventors contributed to match machines, each performing a function, but real mechanical impetus came in 1883 when Ebenezer Beecher of Connecticut designed three "continuous" automatic match-making machines by combining all

functions in one device. Beecher made these machines for Ohio Columbus Barber, of the newly formed Diamond Match Company, and they became the models for all future equipment

in the industry

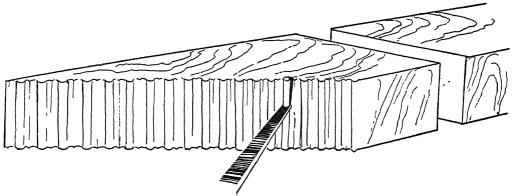
Modern Methods of Manufacture.—The methods used to manufacture all types of matches are basically the same. The wood or paper for the splints must be cut into proper size, dipped to create the heads, dried and assembled in books or boxes for retail sale

suring a flat pack. The boxes, covers, and wrappers for the matches are made in the same factories as the matches and the output is synchronized so that matches and containers reach the packaging machinery simultaneously

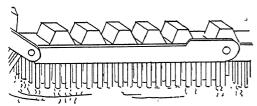
Some United States factories have as many

some United States factories have as many as 20 continuous automatic match machines, each capable of producing 10,000,000 matches in an eight-hour shift, a factory total of 200,000,000 each one-shift day. Shipment of a day's output

would require five freight cars.



Razor-sharp dies hew the match splints from pine blocks, then lodge them in perforations in the steel plates of an endless chain

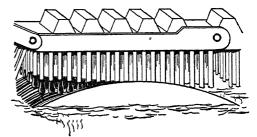


Cut from straight-grained white pine, match splints are carried on an endless chain until completed, then counted automatically into boxes.

Hence, the making of the strike-anywhere match on the modified Beecher machine gives a good overall picture of the processes involved.

The machines, 60 feet long, two stories high, convert blocks of straight-grained pine into packaged matches in 60 minutes at a rate as high as 1,125,000 an hour. The pine blocks, cured from 12 to 18 months, are fed into the head of the machine where a row of from 42 to 57 dies cuts the splints and fixes them into perforations in an endless chain of metal plates, each with 12 rows of perforations. It is this operation which creates the visible indented collars at the holding tips of all round wooden matches.

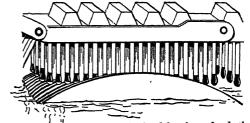
The dies cut 350 rows of 42 to 57 splints each minute, setting them into the plates on which they ride through a series of five dips and baths which treat the wood against afterglow, provide a collar of paraffin to speed combustion, put on the main bulb and its "eye" and finally dip the heads with a solution which protects them from weather changes. Punched out of their plates after the final drying, the matches pour down a trough to drop into endless chains of boxes waiting for them. On the larger-size boxes an ingenious device turns the matches so that approximately half the heads are to the right, and the balance to the left, as-



Riding upside down on steel plates, the match splints pass through grooves in a roller rotating in a vat of composition which creates the main bulb of the head.

Book matches are not made on a single continuous machine but in two separate operations under the same roof. The first machine, called "cut, set and dip," slices rolls of pretreated cardboard into combs of 60 matches each then carries them through paraffin and head-forming dips. The combs are then inserted in a booking machine which assembles covers and combs, stitches them together for packing in caddies of 50 books each.

Modern machinery, plus increased revenue from the adverusing revenue on book matches,

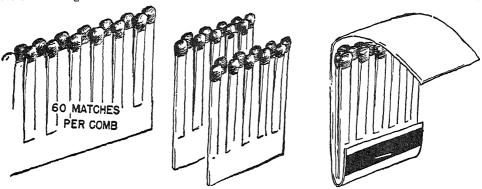


After the main bulb of the head has been dried, the matches pass through another up which fashions the "eye" of sesquisulphide of phosphorus.

424 MATE

has kept United States production costs at a minimum. As a result match prices, unlike those of most other household necessities, have remained the same for a half century despite increased labor and material charges. Five cents for a box of strike-anywhere matches and a penny for safety matches has been standard for more than two generations.

logical Warfare Branch selected book matches to carry morale-lifting messages to nations held captive by the Axis early in the war. Millions of these books with messages in Burmese, Chinese, Greek, French, Spanish, Dutch, Italian, and English printed on their covers were dropped by Allied planes behind the enemy lines Before the invasion of the Philippines, when native



Book matches are sliced in "combs" of 60 from a roll of pretreated cardboard. After the heads have been put on, the "combs" are cut into proper widths, usually 10 matches, and stapled in two layers between the paper covers.

Since the turn of the century, match machinery has been constantly improved, and there have been three outstanding advances in American matches. The first of these, the nonpoisonous match, has already been discussed second was an improvement in the safety factor. It had been known, long before 1912, that match splints treated with an aqueous solution of ammonium phosphate retained no ember or afterglow when the match was blown out. Matches made under the veneer method (cut separately and dipped in composition in bundles) had been impregnated against afterglow simply by tossing them into vats of solution. But American matches were cut and made on a single machine which barred this method. But in 1912, fresh from his triumph with the nonpoisonous match, William A. Fairburn, developed a spray attachment for the continuous match machine which would impregnate matches in course of manufacture. As with his previous development, Fairburn gave blueprints to the rivals of Diamond Match Company in the interests of fire prevention.

World War II produced another advance, the waterproof match, dream of matchmakers since the birth of the industry. The United States War Department needed a match that would function in the long ramy seasons of the South Pacific and called on the industry for help. Raymond Davis Cady, chief chemist for Diamond Match, produced a formula, approved by the army, which resulted in matches which can remain under water eight hours yet still function. The match went into production Dec. 7, 1943, and was supplied at the rate of more than 10,000,000 daily to the armed forces. The Quartermaster Board, United States Army, was offered the formula for lending to other manufacturers in the war effort. Universal and Ohio Match companies were also large producars of water resistant matches for the services.

Another war service performed by matches was in the propaganda field. Because of their compactness, cheapness, and scarcity (even in normal times) in foreign countries, the Psycho-

morale was at low ebb, American aircraft scattered 4,000,000 books of matches to notify the enslaved natives: "I Shall Return—Douglas MacArthur"

Labor and material shortages upset production figures in the United States during the war, but normally America makes 200 billion each of book and strike-anywhere matches and 100 billion safety matches annually, the largest mational output in the world. Other large manufacturers are Great Britain, Russia, and Sweden. Before the war, Japan ranked high in match volume and for a period flooded the United States and other countries with cheap matches, packaged in containers so nearly like those of leading manufacturers that only close scrutiny revealed their real origin.

Except for a period of six months during the war when the United States Army and Navy requisitioned 100 per cent of the safety and 35 per cent of the book matches, there has never been a match shortage in the United States

One of the interesting features of the match industry is that more than half of the value of the goods it makes represents wages paid to its employees. For most products labor's wages represent only a small percentage of the value.

STUART LITTLE Writer and Publicist.

MATE.—A deck officer in the Merchant Marine ranking below the captain. If there is more than one mate, they are designated first mate, second mate, and so on. See Petty Officer.

MATÉ or PARAGUAY TEA. The dried and powdered leaves of *Ilex paraguayensis*, infused and sweetened with sugar. It is sucked up through a special tube which strains off the leaf particles, is aromatic and somewhat bitter, and has refreshing and restorative effects. Large quantities are grown and consumed in Parana, Brazil. *Ilex paraguayensis* is a tree allied to the holly, *Ilex aquifolium*. The exportation of maté

is to Paraná what the exportation of coffee is to the neighbor state of São Paulo: the basis, practically, of economic achievement. Brazil alone produces about 200,000 tons annually, exporting 40 per cent to her neighbors.

MATEHUALA, mä-tā-wà'là, Mexico, a southern town of the state of Nuevo Léon, with silver-melting establishments and important silver mines in the vicinity Gold and copper are also found nearby in paying quantities The city is well built, has several plazas and wide streets. Pop 12,000

MATERIA MEDICA (Lat. "medical matter"), that division or branch of medical science which treats of drugs, their origin, classification as natural products, preparation, purifi-cation, action on the animal economy, together with the mode of administering them for the relief and cure of disease. The action of the various agents in the materia medica upon the human family has been ascertained by experience, sometimes by experiment, especially by administering various drugs to some of the lower order of animals such as dogs, cats, rabbits, guinea pigs, rats and mice Perhaps the best general classification of medicine is as stimulants, sedatives, narcotics, emetics, alteratives, tonics, anæsthetics, antispasmodics, astringents, spinants, cathartics, diaphoretics, diuretics, blennorrhetics, emmenagogues, hæmatinics, antacids, irritants, demulcents, coloring agents and anthelmintics. This classification is based upon the direct effect of the different drugs upon the tissues of the human economy under the various headings which drugs may be conveniently grouped under four general sections, namely: 1. Those which have a special action on the brain, spinal cord and the general nervous system. 2 Those which have a special action on the secretions 3. Those which change the blood. 4. Those which act locally, when applied to the surface of the body. Section (1) includes antispasmodics, anæsthetics, astringents, narcotics, tonics, sedatives, spinants and stimulants. Section (2) includes the emetics, emmenagogues, blennorrhetics, diuretics, diaphoretics and cathartics Section (3) includes alteratives, antacids and hæmatinics Section (4) includes anthelmintics, coloring agents, demulcents and irritants See PHARMACOPŒIA; THERAPEUTICS.

MATERIALISM, the philosophical theory that everything which exists is ultimately material in nature, or that whatever is real can be derived and explained in accordance with the laws of material phenomena. This, of course, carries with it a denial of the reality of any finite or infinite spirit as an immaterial substance and a repudiation of all forms of idealism, which uses thought or intelligence as a principle of explanation. Materialism, however, may be more or less explicit and may maintain either absolutely, or with various modifications, the primary and all-embracing character of mat-Thorough-going materialism asserts that nothing exists but physical bodies and physical What are called immaterial substances and processes it either declares to be unreal, or explains away as ultimately not different in nature from physical substances and processes. Moreover, for materialism of this consistent and uncompromising type, matter is

dead and moved only by mechanical forces. It has no "psychic side," and the laws which it obeys are the expressions of a blind physical necessity. This extreme view is perhaps no longer maintained by any philosophical thinker of reputation, but in various modified forms it still exists as a tendency to subordinate mental phenomena to physical processes. The more important of these modifications and limitations may be brought under the following heads. (1) The subordination of mental phenomena, while still acknowledging more or less explicitly their distinctive character, to physical, and especially to physiological processes as their determining causes. This position does not usually avoid any of the practical consequences of materialism, and always tends, when thought out, to revert to the strict ontological form of the theory. For it is an easy transition from the view that physical processes are able to cause mental modifications to the opinion that the mind is not fundamentally different in char-The view that matter which affects it. (2) The view that matter is not a dead lump or mass that moves only when acted upon by some external body, as the older theories assumed, but that every particle of matterevery atom, or it may be every cell—is "con-joined with a soul," or has a "psychical side," or "contains a certain element of mind-stuff" By thus introducing an element which is different in character and in mode of operation from matter, this theory seems to differentiate itself in principle from materialism Nevertheless, it is usually assumed tacitly by representatives of this modern Hylozoism that within the atom or cell the material side is the primary and determining element, while the physical is secondary and subordinate. Moreover, the whole mode of conception usually remains at the mechanical stage, since the immaterial element never comes to its rights as an ideal principle, but is conceived as a mere moving force or instinct, and also since it is assumed that the complex mental life can be built up by the composition of psychic elements just as a material body is constituted by the combination of its parts. (3) The position of energism. Recently an attempt has been made to find in energy an ultimate reality in terms of which both mental and material phenomena may be expressed. It cannot be maintained, however, that the conception of energy has yet been clearly defined, nor is everyone prepared to accept the assurance of Professor Ostwald, the chief representative of the theory, that energy is the concrete reality which we directly experience. To many it may appear to be merely an abstract conception built out of the data of experience. Apart from this difficulty, however, energism does not avoid materialism merely by dematerializing its fundamental principle. In Professor Ostwald's hands, it appears to remain essentially materialistic; since the conceptions employed and the laws which the transformations of energy obey are those of physical science.

If the period of the Middle Ages is excepted, when philosophical thought was determined mainly by theological conceptions, materialism may be said to have held a place throughout the whole history of philosophy. We have already noticed some of the forms in which this

mode of thought continues to appear at the present day, and may now refer briefly to its more important historical representatives systems of the early Greek philosophers who found the fundamental principle of things in some physical substance, such as water, air or fire, cannot properly be classed as materialism For as yet there was no opposition between the material and the spiritual. Neither the conception of matter as lifeless and unintelligent substance, nor of mind as an immaterial directing principle, had yet been formed Atomism, as developed by Democritus of Abdera, is the first thoroughgoing system of materialism. Democritus taught that the soul, like everything else, is an aggregate composed of atoms. The soul-atoms differ from all the others in being the finest, smoothest and most mobile When they are in isolation, they are insensible, but from their union sensation arises From sensation all the other processes of the mental life originate. The same conclusions were maintained by the Epicureans, who adopted without any essential modification the theory of atomism. In spite of the statement of the Stoics that whatever exists is corporeal, their system cannot properly be described as materialism. For the human soul and God, the all-embracing Logos of which the human reason is a spark of emanation, though constantly described in materialistic terms, yet function ideally as rational directing forces.

Materialism was revived in modern times by Gassendi (1592–1655) (qv) under the form of atomism. Modern materialism was, however, first worked out by Thomas Hobbes (qv), who based it upon the mechanical conceptions which in his day were being made the basis of all physical science He did not deny the existence of immaterial things—God, angels, pure spirits - but shrewdly contented himself with showing that only that which is composed of parts, that is, bodies, can be the object of thought and so be known. All real phenomena must therefore be explained in accordance with the mechanical theory and in terms of the move-ment of bodies Under the influence of the developing physical sciences and especially of the dominant conception of mechanism, materialistic tendencies played an important part in the thought of the 18th century. David Hartley (1704-57) and Joseph Priestley (1733-1804) (q.v.) definitely subordinated the mental life to the bodily processes, though the latter attempts to reconcile his materialism with Christianty and even to support it by appealing to the Bible. It is in France, however, in the systems of La Mettrie (1709-51), Baron d'Hol-bach (1723-89), and Cabanis (1757-1808) (qv) that we find in this century representatives of materialism who do not hesitate to draw the most extreme consequences of their doctrine, to deny the existence of God and to reduce man to a mere piece of physical mechanism. Again, in the middle of the 19th century, a revival of materialism occurred in Germany which had an important popular influence. The most important names connected with this movement are Carl Vogt, J. Moleschott, H. Czolbe and Louis Büchner (whose book, 'Kraft und Stoff')—(Force and Matter)—has been called the Bible of German materialism, and has passed through numerous editions in its English translation). The general adoption of

the evolutionary point of view was in the beginning at least favorable to materialism. The philosophical problem seemed to be to derive from some primitive form of matter all the various modes of existence in accordance with the established laws of physical evolution. To this task Herbert Spencer (qv.) devoted his life with a result that is variously estimated in different quarters. It can at least be said that at present thinkers are more inclined than formerly to question the adequacy of physical science to furnish a complete and final explanation of the nature of the evolutionary process

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MATHEMATICAL INDUCTION. See INDUCTION, MATHEMATICAL

MATHEMATICAL SIGNS AND SYM-BOLS, in mathematics, a symbol employed to denote an operation to be performed, to show the nature of a result of some previous operation, or to indicate the sense in which an indicated quantity is to be considered The present mathematical symbolism is due to the labors of many men - men having different habits of thought, men living in different ages, men speaking different languages. A physicist will employ sine a and sine b to calculate the angle of refraction of light. Now certainly there is neither sine a nor sine b in reality; yet there are most certainly relations of reality which are accurately described in these expressions, sine a and sine b Such is the function of all signs, symbols or characters Whenever the eye can be brought to the aid of one's imaging faculty, a success in grasping a thought may often be gained which would otherwise be a failure This is in particular true in mathematics where the subject matter, while objective, is non-sensible. In this way signs, and symbols, stand for the emphatic presentation of mathematical ideas, often very subtle even when symbolized; and with such signs these ideas become, as it were, easy to exhibit, that is, in thought; and the relations of these ideas become thinkable, even very often to the whole complex train of ideas in which they occur.

One very important property for symbolism to possess is that it should be concise, so as to be visible at a glance of the eye and to be rapidly written. A sign should if possible always represent the same object, and the same object should always be represented by the same sign. If a new sign be advisable, permanently or even temporarily, it should carry with it always some mark of distinction from that which is already in use, unless it be a demonstrable extension of the latter (De Morgan). The importance of notation is recognized when it is remembered, for example, how great an advance toward the solution of the famous problem of the three bodies was made when special attention was given to it, and a special symbolism chosen for it. And the invention of the symbol \equiv Gauss affords

a fine example of the advantage which may be derived from a good notation; it, without exaggeration, marks an epoch in the development of the science of arithmetic. The language of analysis, says Laplace, being in itself a powerful instrument of discoveries, its notations, especially when they are necessarily and happily conceived, are so many germs of new calculi.

Nowadays we have a symbol for each mathematical operation. Sometimes, even a choice of symbols. And most of the letters of the English alphabet are now engaged for special mathe-

matical purposes. Thus:

a signifies sometimes a finite quantity; at other times a known number, the side of a triangle opposite A; also an intercept on the axis of x, and, finally, altitude.

b like a signifies a known number, and also

a side of a triangle, the one opposite B; it also stands for base; and lastly, for an intercept on the axis of y.

c signifies constant.

e signifies the base of the Napierian logarithms

A considerable inroad has been made, also, into the Greek alphabet.

 γ signifies the inclination of the axis of x;

 π stands for the ratio 3 14159;

ε is used for sum of tens similarly obtained:

σ indicates the standard deviation in the theory of measurements

Some examples of reading notation may be given:

a+b, a-b, $a \div b$, $a \times b$, and $a \sim b$ are read a plus b, a minus b, a divided by b, a multiplied by b, and the difference between a and b.

Further: -a > b, a < b, a = b, $a \sim b$, and $a \equiv b$ are to be read a greater than b, a less than b, a equal to b, a approximating to b, and (Gauss'

symbol) a identical with b.

Our present day symbols of operation, + (plus) and — (minus), appear to be among the oldest. Both are found in Widmann's arithmetic published in 1489, at Leipzig. In the time of Widmann, the symbols (), X, + > and < were unknown. Rudolff had already begun to employ the radical sign. But = had not yet appeared. In those days almost everything was expressed by words, or mere abbreviations. Yet even then both cubic and biquadratic equations had already been solved; the methods even were published Oughtred used the term "separatrix" in sense of a mark be-tween the integral and fractional parts of a number written decimally. His symbol for a separatrix was L. Stevens had already used a figure a circle over or under each decimal place to indicate its order. And of the various separatrixes that have been employed by mathematicians, four are still employed: (a) A vertical line is still employed to separate cents from dollars in ledgers, etc. Such a separatrix appears already in 1613, employed in a work by Richard Witt. Napier also used a vertical line for the same purpose in his 'Rabdologia,' in 1617; (b) a period, still employed as a separatrix, is so used as early as 1612 in the trigonometry of Pitiscus, a German. Napier, in his 'Rabdologia,' speaks of so employing a period or comma. The period has always been the prevailing form of the decimal point in America; (c) the Greek colon, a got above the line, was advocated as a

separatrix by no one less than Sir Isaac Newton His desire was to prevent it from being confounded with a period used as a mark of punctuation. This form of the decimal point is now commonly used in England; (d) Pituscus is the author of an Italian work on trigonometry. He, in this work, published in 1608, uses a comma as a decimal point Kepler, in 1616, seems to have introduced this mark, the comma, into Germany for the same purpose. Briggs likewise used a comma in his logarithmic tables, in 1624; and several other early English writers generally employed the comma as a decimal point. But to-day the comma is customary form of the decimal point, not in England, but in countries upon the mainland of the European continent.

For example: 1 would in America be written decimally as 150; in England as 150; and in Germany, France and in Italy as 1,50.

Symbols in general may now be mentioned: The sign of cancellation is simply drawn across the factors cancelled, like the one drawn across the zeros above. These with the ordinary Arabic and Roman numerals and the abbrevi-letters of the alphabet; or by the final letters with one or more accents, as x', y'', z'''. Besides letters of Greek and even of the Hebrew alphabet are employed. Thus M stands for "modulus" of any system of logarithms. π has been spoken of.

Of symbols of operation, multiplication may be indicated by placing a point between the factors when both are expressed by letters, as a. b. In a series multiplication between factors expressed even by numbers, may be expressed by a point between such factors. When ~ is used between two quantities, it denotes difference, but not which quantity is to be subtracted from the other. Division has been sometimes indicated thus: $a \mid b$ The radical sign, V, when placed over a quantity indicates that its root is to be taken. Thus \sqrt{a} denotes

the square root of a In the same manner \sqrt{a}

and \sqrt{a} are read the cube root and the nth root of a, respectively. Here and n give the index of the radical. A vinculum, —, a bar |, brackets [], and parentheses () all indicate that the quantities enclosed by them are to be regarded together as wholes. In algebra, Σ denotes that the algebraic sum of several quantities of the same nature as that to which the sign is prefixed is to be taken. The letter f, and ϕ , written before any quantity, or quantities, separated by commas, as

F(x), f(x,y), $\phi(x,y,z)$, et cetera, denote quantities depending upon the quantities, or the quantity, within the parenthesis, without designating the nature of the relation. The signs of proportion, : :: :, when placed between quantities show them to be in proportion. R, r and ρ , and other symbols, denote radii of circles L, l and λ may denote latitude. The leading letters of the Greek alphabet are also

sometimes used to denote known angles; and the final letters of the same alphabet to denote unknown angles And when several quantities of the same kind are involved in an investigation, they may be designated by the same letter differently accented; thus. a'a''a''', a_1 , a_2 and a_3 . An older usage of o denotes an infinitely small quantity; and only sometimes absolute zero Clearer thinking has impelled moderns to use i (10ta) or i for an infinitesimal, and to denote by o, absolute zero, and that only. The symbol ∞ , first employed by Wallis in the 17th century, has long been used both for a variable increasing without limit and for absolute infinity. Taylor, in 1898, introduced the symbol %, a contraction of % for an infinite, the reciprocal of an infinitesimal. The sign. denotes then or therefore; and the sign :, since or because. The y = f(x) is a general sign, indicating that there is a general relation between y and x — that is, y and x are so connected that x cannot change without y changing at the same time. The symbol F(x, y, z,) = 0 implies that there is a general relation between x, y and z, without specifying the relation. The symbols sin, cos, tan, co-tan, sec, co-sec, ver-sin, co-ver-sin, are abbreviations used, respectively, for the words "sine," "cosine," "tangent," "cotangent," "secant," "co-secant," "versed-sine" and "co-versed-sine." When the arc is supposed, as in trigonometry, to depend for its value upon any of the trigonometric lines, the function is called the inverse tri-gonometric function. The following symbols are used to denote this kind of a relation: $sin^{-1}y$, $cos^{-1}y$, $tan^{-1}y$, $cot^{-1}y$, $sec^{-1}y$, $cos^{-1}y$, $cos^{-1}y$, $ver-sin^{-1}y$, $cos^{-1}y$, $cos^{-1}y$.

These stand, respectively, for the arc whose sine, cosme, tangent, co-tangent, secant, co-secant, versed-sine and co-versed-sine, is y. The principle of notation has been extended to all inverse functions; thus:

 $\log^{1} y, d^{-1} (x d x), \text{ etc.}$

These stand, respectively, for the quantity whose logarithm is y, and the quantity whose differential is x d x, etc. The differential of a function, or independent variable, is denoted by d, thus:

 $d(y^2) = 2ydy$

If we suppose the form of a function to vary, the symbol employed to denote the variable is δ , thus:

 δu , δy , δx .

If both the form of the function and the independent variable of the function vary together, the resulting variation is denoted by the symbol D, thus:

 $D f(x,y) \ldots$

The differential is the difference between two consecutive states of the quantity differentiated. If it is desired to represent the difference between two states of a function which are not consecutive, the symbol \triangle is employed. Successive tween two states of a function which are not consecutive, the symbol \triangle is employed. sive finite differences are represented by thesymbols:

 $\triangle u$, $\triangle^2 u$, $\triangle^3 u$, $\triangle^4 u$, etc.

We have already spoken of Σ as used in algebra, where it denotes an algebraical sum. Its use in the calculus is principally restricted to the denotation of the sum of the finite differences of a function The symbol \int denotes

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an integration to be performed, while the symbol \int_a^b is used to denote a definite integral taken between the limits a and b The symbol $\Gamma(x+1)$ stands for the integral $\int_e -v_x x - i_{dn}$ The vector sign is U $\Gamma\beta$, in quaternions. should be read tensor of B.

In the foregoing list nearly all the symbols, commonly employed by American mathematicians, have been enumerated; as well as

some used abroad

MATHEMATICAL SOCIETIES AND JOURNALS. The oldest of the sciences. mathematics has always been cultivated and fostered, often with a degree of preferment over the later branches of the tree of knowledge, by the universities, the great academies and the other scientific bodies of a general scope throughout the civilized world. The indispensable condition for satisfactory progress, facility of publication, has been provided for mathematicians in a very large degree by the 'Transactions' and 'Proceedings' of learned societies representing a wide scientific field The specialist will usually prefer the mathematical journals proper, which indeed send out in a steady flow the finest product of the mathematical genius of the age. Theirs is the post of honor; it lies with them, by critical encouragement or repression, to maintain the standard of excellence of a great profession.

But there remains another set of functional descriptions of the standard of excellence of a great profession.

tions, which are more and more efficiently per-formed by the mathematical societies. These include in their membership nearly every mathematician of standing in the four quarters of the globe. They provide a professional forum for the discussion of mathematical questions and of mathematical interests, and furnish the powerful stimulus of association and solidarity. Their activities cover a wide range, including the presentation and publication of papers and memoirs, the encouragement of bibliographic and encyclopedic undertakings, the organization of international congresses, special conferences and lectures, the exercise of a beneficial advisory influence on the mathematical curricula and equipment of the schools and universities, the diffusion of a better understanding of the science in the educated world, the formation of libraries, collections of models, and the promotion of agreeable so-cial and personal relations among mathematicians.

The following list comprises the principal mathematical societies of the world, arranged in chronological order of foundation, with mention of their several publications:

1690. Mathematische Gesellschaft in Hamburg. Mitteilun-

Mathematische Gesellschaft in Hamburg. Mittenungen, 1881—.
1778. Wiskundig Genootschap te Amsterdam. Wiskundige Opgaven mit de Oplossingen, 1855—, Nieuw Archief voor Wiskunde, 1875—, Revue Semestrielle des Publications Mathématiques, 1892—.
1866. London Mathematical Society, Proceedings, 1865—.
1866. Moscow Mathématique Society, Transactions, 1869–1873. Société Mathématique de France, Bulletin, 1873—.
1883. Mathematical Society of Edinburgh, Proceedings, 1884—.

1883. Mathematical Society of Edinburgh, Proceedings, 1884—.
1884 — Circolo Matematico di Palermo, Rendiconti, 1884—.
1886. Mathematical Society of Charkow, Bulletin, 1879.
1888. American Mathematical Society, Bulletin, 1891—; Transactions, 1900—; Mathematical Papers of the Chicago Congress, 1896; Colloquium Lectures on Mathematics, 1905, 1910, 1913, 1914.
1890. Deutsche Mathematiker-Verenigung, Jahresbericht, 1892—.

1895. British Mathematical Association, Mathematical Ga-

1895. British Mathematical Association, Mathematical Gazette, 1894—.
1909 Indian Mathematical Society, Journal, 1909—
1909 Calcutta Mathematical Society, Bulletin, 1909—
1911 Sociedad Matematica Española, Revista, 1911—.
1915. Mathematical Association of America, American Mathematical Monthly, 1894—.

A history of the Hamburg Society, pre-pared in connection with the celebration in 1890

of its 200th anniversary, may be found in volume II of the 'Mitteilungen'

The 'Wiskundig Genootschap' renders an especially valuable service in the mathematical world by the publication of the 'Revue Semestrielle, a condensed abstract of all the mathematical papers published in the various journals, constantly brought up to within a few months of the current date. The value to a productive mathematician of this great labor-saving device is quite inestimable

The first president of the London Mathematical Society was the illustrious De Morgan, and the roll of members has included the names of Cayley, Sylvester, H J. S. Smith, Clifford, Salmon, Stokes, Kelvin and most of the other eminent British mathematicians of the time. The secretary's office was efficiently filled for the long period of 34 years (1867-1901) by the late Robert Tucker. The Proceedings, which is the leading British mathematical journal, has The memberrecently been enlarged in size.

ship of the society is about 300.

The Société Mathématique de France has about the same membership. The meetings are about the same internership. The meetings are held twice a month at the Sorbonne. The president of the society for 1916 is M Fouché, the secretaries are MM. Lévy and Montel. The council includes Appell, Borel, Jordan, Painlevé and Picard. The 'Bulletin' is issued

quarterly.

The Deutsche Mathematiker-Vereinigung represents in full measure the fruitfulness and vigor of German mathematics. Its organization had been foreshadowed for many years, but was actually brought about in 1890 by the initiative of members of the mathematical-astronomical section of the older Society of German Natural Scientists and Physicians, in affiliation with which the Vereinigung still con-tinues to hold its annual meetings. The aptinues to hold its annual meetings. The appearance of the 'Jahresbericht,' whose volumes were originally issued in parts of book form, signalized the beginning of a series of invaluable reports on various branches of mathematics, beginning with the celebrated report by W. F. Meyer on 'The Present Status of the Theory of Invariants' (Vol. I, 1892). These reports and other undertakings of a bibliographical, critical and statistical character ultimately led to the plan of the 'Encyclopedia of Mathematics, now in course of publication by Teubner, under the auspices of academies of science of Munich, Vienna and Göttingen. The Vereinigung has also played an active part in the organization of the international congresses of mathematicians, notably those of Zurich (1897) and Heidelberg (1904). It has interested itself effectively in the questions concerning the teaching of mathematics in the schools, universities and technical institutes, the training of teachers, the correlation of instruction in pure and applied mathematics and other matters of reorganization and progress in education, some of which are phases of an international reform

movement. A history of the Vereinigung by the former secretary and present editor of the 'Jahresbericht,' Prof. A Gutzmer of Jena, was issued on the occasion of the Heidelberg congress The society has at present about 650 members Meetings are held annually. It recently received from B. G. Teubner the gift of a complete set of his extensive mathematical publications as the nucleus of a library The 'Jahresbericht,' now published monthly with occasional double bimonthly numbers, contains, beside the earlier reports mentioned above and a record of the society's activities, addresses, biographies and necrologies, original papers, criticisms, discussions and reviews and notes on current events. More extensive papers are pub-

lished as separate volumes

The American Mathematical Society was originally organized as the New York Mathematical Society in 1888 and was reorganized under its present national title in 1894. Sylvester's work at Baltimore (1877-84) and the influence of young mathematicians returning from study in Germany had produced a tidal movement of which the society has since its early days been the forefront and exemplar. Its membership, now about 740, includes practically every mathematician in the United States, and a considerable number of foreign representatives. The 'Bulletin,' published since 1891 in monthly numbers from October to July, is of the type later adopted by the 'Jahresbericht, but contains also the official reports of the frequent meetings of the society, with abstracts of the papers presented and a complete bibliography of recent mathematical publications. Another special feature of the 'Bulletin' is the extensive "Notes" on current events in the mathematical world. The 'Transactions,' founded in 1900, is the official organ of the society for the publication of the more important papers read before it. The library of the society, now including 5,000 bound volumes, The library of is deposited in the Columbia University Library.

Regular meetings are held four times a year in New York and twice a year in Chicago. Officers are elected at the annual meeting in December. A summer meeting is also held each year at some specially chosen place. At intervals of two or three years the summer meetings are reinforced by colloquia, or courses of lectures by specialists on recent advances in their particular lines of work. rapid growth of mathematical interest in the Central and Western sections of the country have led to the organization of a Chicago Section (1898), a San Francisco Section (1902) and a Southwestern Section (1907). The sections of the section of th

tions meet once or twice each year.

The presidents of the society have been J. H. The presidents of the society have been J. H. Van Amringe, 1888-90; Emory McClintock, 1890-94; G. W. Hıll, 1894-96; Sımon Newcomb, 1896-98; R. S. Woodward, 1898-1900; E. H. Moore, 1900-02; Thomas S. Fiske, 1902-04; W. F. Osgood, 1904-06; Henry S. White, 1906-08; Maxime Bocher, 1908-10; H. B. Fine, 1910-12; E. B. Van Vleck, 1912-14; E. W. Brown, 1914-16; L. E. Dickson, 1916- The secretaries have been Thomas S. Fiske, 1888-95, and F. N. Cole. 1895-. The business of the society is Cole, 1895-. The business of the society is transacted by a council composed of the officers, ex-presidents, editorial committee of the

'Transactions,' secretary of the Chicago Section and 12 other members elected for a term of three years.

While the society is more especially devoted to the advancement of the higher branches of mathematics, it exerts a considerable influence both directly and through its members on the teaching of the subject in the schools and universities. The report of a committee of the society on college entrance requirements in mathematics has been adopted by the College Entrance Examination Board A report on the requirements for the master's degree, presented to the Chicago Section, has been favorably recognized by several of the Western universities. The society has also contributed materially to bring about the organization of associations of teachers of mathematics throughout the country, a movement especially stimulated by Professor Moore's presidential address in 1902.

Historical notices of the society may be found in the presidential addresses of Dr. Mc-Clintock ('Bulletin,' January 1895) and Professor Fiske (ib, February 1905). Other notices are scattered through the secretary's reports. The society, which has increased its membership by 50 per cent in the last 12 years, serves to-day to bring together in a harmonious whole all the mathematical activities of America is a centre not only of scientific activity but also of professional good feeling and agreeable personal relations.

The British Mathematical Association, formerly known as the Association for the Improvement of Geometrical Teaching, is devoted to improved instruction in elementary mathe-

matics.

The Mathematical Association of America, organized in 1915 to represent the field of collegiate mathematics, has now over 1,100 members. It has adopted as its official organ the American Mathematical Monthly. The presidents of the Association have been E. R. Hedrick, 1915-17, and Florian Cajori, 1917-). The secretary-treasurer is W. D. Cairns. Meetings are held twice a year, usually in connection with those of the American Mathematical Society. Nine local societies have thus far been organized, holding meetings usually twice a year.

The international congresses of mathematicians have been mentioned above. While these are individually but temporary gatherthey had come, before the war, to be an established institution of great and permanent value. Their sequence of time and place is: Paris, 1889; Chicago, 1893; Zurich, 1897; Paris, 1900; Heidelberg, 1904; Rome, 1908; Cam-

bridge, 1912.

The exchanges of the American Mathematical Society include about 140 journals which regularly publish mathematical papers of ap-preciable value. In the notices appended to his collection of abbreviated titles of journals ('Jahresbericht der Deutschen Mathematiker-Vereinigung,' Vol. XII, 1903, pp. 426-444) Felix Muller sets the grand total ever published of all journals of a fairly mathematical complexion at about 1,200, of which over 600 now survive. More than 300 journals are cited in the references of the early numbers of the 'Encyclopedia of Mathematics.' The 'Revue Semestrielle'

reports the contents of some 250 journals; the (Fortschritte) list is about 170

The oldest journals in Muller's list are the 'Philosophical Transactions' and the 'Journal des Savants, both dating from the year 1665 Following these are the publications of the academies of Paris (1666) and Bologna (1690). academies of Paris (1000) and Bologna (1690). From the 18th century there still survive, beside the journals of the academies (Berlin 1700; Petersburg, 1724; Gottingen, 1751; and others), also the 'Memorie di Matematica e di Fisica' (1782) of the Società Italiana, the 'Bulletin' (1789) of the Società Philomatioue of Paris, and the 'Journal de l'Ecole Polytechnique' (1794) Among the extinct journals may be mentioned the 'Ladies' Diary' (1704). 'Gentlemen's Diary' (1741), these two nais may be mentioned the 'Ladies' Diary' (1704), 'Gentlemen's Diary' (1741), these two uniting in the 'Lady's and Gentlemens Diary' (1841–71); the 'Cambridge Mathematical Journal' (1839–45), the forerunner of 'Sylvester's Quarterly Journal'; Gergonne's 'Annales de Mathématique' (1810–31); Tortolini's 'Annali' (1850–57), superseded by the present 'Annali di Mathematica' and the various sources (1706 Mathematica⁵, and the various journals (1786-1825) of Hindenburg, Breithaupt, Bessel, Kretschmar. In America the ephemeral existences are chronicled of the 'Mathematical Correspondent' (1804-06), 'Adrain's Analyst' (1808) and 'Mathematical Diary' (1825-32), 'Mathematical Companion' (1828-31), 'Mathematical Miscellany' (1836-39), 'Cambridge Miscellany of Mathematics, Physics and Astronomy' (1842-43), 'Runkle's Mathematical Monthly' (1858-61). The publication of the 'Analyst' (1874-83) marked a substantial advance Mar-'Mathematical Visitor' (1877) tin's 'Mathematical Magazine' (1882), the 'Mathematical Magazine' (1882) and 'Mathematical Messenger' (1884) are extinct.

The following list gives the date of founda-tion, the title and the present place of publication of the strictly mathematical journals now in existence and not already cited in connection with the list of mathematical societies

above:

1826. 'Crellès Journal für die reine und angewandte Mathematik,' Berlin.
1836. 'Liouwille's Journal de Mathématiques pures et appliquées,' Paris
1842. 'Nouvelles Annales de Mathématiques'
1855. 'Quarterly Journal of Pure and Applied Mathematics,'

London.

1858. 'Annali di Matematica pure ed applicata,' Milan.

1863. 'Giornale di Matematiche di Battaglini,' Naples.

1868. 'Mathematische Annalen,' Leipsic.

1870. 'Bulletin des Sciences Mathématiques,' Paris.

1871. 'Jahrbuch über die Fortschritte der Mathematik,'

Berlin. 1878.

1882. 1884.

1884.

Berlin.

'Messenger of Mathematics,' London.

'American Journal of Mathematics,' Baltimore.

'Mathesis,' Ghent

'Acta Mathematica,' Stockholm.

'Annals of Mathematics,' Cambridge, Mass.

'Bibliotheca Mathematica,' Leipsic

'Periodico di Mathematica' (Supplemento 1898),
Lechorn 1886. Leghorn

1886. Periodico di Mathematica (cupplemento 1899).

1890. 'Nyt Tidsskrift for Matematik,' Copenhagen.
1891. 'Revue de Mathématiques speciales,' Paris.
1894. 'American Mathématical Monthly,' Springfield, Mo.
1894. 'L' Internédiaire des Mathématiciens,' Paris.
1895. 'Gazeta Matematica, Bucharest.
1896. 'Il Pitagora,' Palermo.
1896. 'Revue de Mathématiques,' Turin.
1897. 'Wiadomosci Matematyczne,' Warsaw.
1898. 'Formulaire Mathématique,' Turin.
1898. 'L' Education Mathématique,' Paris.
1898. 'Bolletino di Bibliografia e Storia delle Scienze Matematiche,' Turin
1899. 'L' Enseignment Mathématique,' Paris.
1900. 'Bolletino di Matematica,' Bologna.
1900. 'Sphinx Oedipe, Nancy.
1909. Mathematics Teacher, Syracuse, N. Y.
1912. Tohokin Mathematical Journal, Sondai, Japan.

MATHEMATICAL SOCIETY, The See AMERICAN MATHEMATICAL American. SOCIETY, THE

MATHEMATICAL SOCIETY, The London, an association formed in the English capital in 1865 by a number of English professors of mathematics for the promotion of that science. It was incorporated in 1894. Since its formation it has regularly published Proceedings) and papers on mathematical subjects. It has an excellent library of scientific works. The Society meets monthly from November to June, the anniversary meeting being held in November.

MATHEMATICS. The science of mathematics — what shall it be said to be? A question much discussed by philosophers and mathematicians in the course of more than 2,000 years, and especially with deepened interest and insight in our own times. Many have been the answers, but none has approved itself as final. answers, but none has approved itself as hind. All of them, by nature belonging to the "literature of knowledge," fall under its law and tend to "perish by supersession." Naturally enough conception of the science has had to grow with the growth of the science itself. For it must not be inferred that mathematics, the science is a sold is dead. Old it is indeed. because it is so old, is dead. Old it is indeed, classic already in Euclid's day, being surpassed in point of antiquity by but one of the fine arts and by none of the "natural" sciences; but it is not only the oldest science, it is also as new as any, living and flourishing to-day as never before, advancing in a thousand directions by leaps and bounds. It is not merely as a giant tree throwing out and aloft myriad branching arms in the upper regions of clearer light and plunging deeper and deeper root in the darker soil beneath. Rather is it an immense forest of such oaks, which, however, literally grow into each other, so that, by the junction and intercrescence of limb with limb and root with root and trunk with trunk, the manifold wood becomes a single living organic growing whole. A vast complex of interpenetrating theories such the science now actually is, but it is more wondrous still potentially, component theories continuing more and more to grow and multiply beyond all imagination and beyond the compass of any single genius, however gifted. What is this thing so marvelously vital? What does it undertake? What is its motive? How is it related to other modes and interests of the human spirit?

One of the oldest, at the same time the most familiar, of the definitions conceived mathematics to be the science of magnitude, where magnitude, including multitude as a special kind, signified whatever was "capable of increase and decrease and measurement." Capability of measurement was the essential thing. That was a most natural definition of the science, for magnitude is a singularly fundamental notion, not only inviting but demanding consideration at every stage and turn of life. The necessity of finding out how many and how much was the mother of counting and measurement and mathematics, first from necessity and then from joy, so busied itself with these things that they came to seem its whole employment But now the ordinary notion of measurement as the repeated application of a constant finite unit 'as been so refined and generalized, on the one hand through the creation of the so-called irrational and imaginary numbers (see ALGEBRA; COMPLEX VARIABLE), and on the other by use of a scale, as in non-Euclidean geometry (see Non-Euclidean Geometry; Analytical Metrics), where the unit appears to suffer lawful change from step to step of its application, that to retain the old words and call mathematics the science of measurement seems quite mept as no longer telling either what the science has actually become or what its spirit is bent upon.

Moreover, the most striking measurements, as of the volume of a planet, the valency of atoms, the velocity of light or the distance of star from star, are not done by direct repeated application of a unit. They are all accomplished by indirection. Perception of this fact it was which led to the famous definition by the philosopher and mathematician, Auguste Comte, that mathematics is the «science of indurect measurement." Here doubtless we are in presence of a finer insight and a larger view, but the thought is not yet either wide

enough or deep enough.

For it is obvious that there is much admittedly mathematical activity that is not in the least concerned with measurement whether direct or indirect. In projective geometry (which see), for example, it was observed that metric considerations were either absent or The fact, to take a simplest subordinate. example, that the two points determine a line uniquely, or that the intersection of a sphere and a plane is a circle, is not a metric fact: it is not a fact about size or quantity or magnitude. In this field it was position rather than size that to some seemed the centre of interest, and so it was proposed to call mathematics the science of magnitude or measurement and posi-

Even as thus expanded, the definition yet excludes many a mathematical realm of vast, nay, infinite extent. Consider, for example, that immense class of things known as operations. These are limitless alike in number and in kind. Now it so happens that there are systems of operations such that any two operations of a given system, if thought as following one another, together thus produce the same effect as some other single operation of the system. For an illustration, think of all possible straight motions in space. The operation of going from a point A to a point B, followed by the operation of going from B to a point C, is equivalent to the single operation of going from A to C. Thus the system of such operations is a closed system: combination of any two operations yields a third not without but within the system. Now the theory of such closed systems — called groups (see Groups) of operations — is a mathematical theory of colossal proportions. But it is obvious that an abstract operation, though a very real thing, is neither a position nor a magnitude.

This way of trying to come at an adequate conception of mathematics, viz., by attempting to characterize in succession its distinct domains, or varieties of content, or modes of activity, is not likely to prove successful. For it demands an exhaustive enumeration, not only of the fields now occupied by the science, but also of those destined to be conquered by

it in the future, and such an achievement would require a prevision that none may claim

Fortunately there are other paths of approach that seem more promising Every one has observed that mathematics, whatever it may be, possesses a certain mark, namely, a degree of certainty not found elsewhere So it is, proverbially, the exact science par excellence Exact, no doubt, but in what sense? To this an excellent answer is found in a definition of the science given about one generation ago by a distinguished American mathematician, Prof. Benjamin Pierce: mathematics is the science which draws necessary conclusions—a formulation of like significance with the fine *mot* by Prof. William Benjamin Smith, to wit: mathematics is the universal art apo-dictic. These statements, though neither of them may be entirely adequate, are, both of them, telling approximations, at once foreshadowing and neatly summarizing for popular use the conclusion reached by the creators of modern logic (see SYMBOLIC LOGIC), that mathematics is included in, and, in a profound sense, may be said to be identical with, symbolic logic Observe that the emphasis falls on the equality of being "necessary," or logically correct. Naught is said about the conclusions being That is another matter for subsequent consideration.

But why are mathematical conclusions correct? Is it that the mathematician has a reasoning faculty essentially different in kind from that of other men? By no means. What, then, is the secret? Reflect that conclusion implies premises, that premises involve terms, that terms stand for ideas or concepts or notions, and that these latter are the ultimate material with which the spiritual architect, called the reason, designs and builds. Here, then, one may expect to find light. The apodictic quality of mathematical thought, the correctness of its conclusions, are due, not to any special mode of ratiocination, but to the character of the concepts with which it deals What is that distinctive characteristic? The answer is precision, sharpness, completeness of determination. But how comes the mathematician by such completeness? There is no mysterious trick involved: some ideas admit of such precision and completeness of determination, others do not; and the mathematician is one who deals with those that do. Law, says Blackstone, is a rule of action prescribed by the supreme power of a state commanding what is right and prohibiting what is wrong. But what are a state, and supreme power, and right and wrong? If all such terms admitted of complete details. admitted of complete determination as do, for example, such terms as triangle and circle, then the science of law would be a branch of pure mathematics. And such, too, to take another example, would be psychology, were consciousness, mind, perception, imagination, and all kindred terms, as completely determinable as the notion sphere. It will be asked, does not the lawyer sometimes arrive at correct conclusions? It may be admitted that he does sometimes, and so, too, of the psychologist or historian or sociologist. When this happens, however, when these students arrive, it is not meant at truth, for that may be by happy chance or by intuition, but when, strictly speaking, they arrive at conclusions that are correct, at conclusions, i.e., that follow logically from completely ascertained data or premises, then that is because they have been for the time acting in all literalness the part of mathematician. That is not to aggrandize the science of mathematics. Rather is it for credit to all serious thinking that, in any considerable garment of thought, one may find here and there, rarely enough sometimes, a mathetic fiber, woven in some perhaps exceptional moment of precise conception and rigorous reason. To think aright is no characteristic striving of a class of men. It is a common aspiration. Only, as before said, the stuff of thought is mostly intractable, formless, nebulous, like some milky way awaiting analysis into distinct star forms of completely determinate ideas.

The mentioned aspiration and the tendence of all thought, of all science, to assume the character of mathematics admit of many illustrations, which at the same time serve to show clearly the ultimate distinction between that thought which is mathematical and that which is not. One or two such illustrations must

suffice.

There is no more common or more important scientific notion than that of function The term is applied to either of two variable things (including constants conceived as special variables, whose variation is zero in amount) so related that to any value or state of either there corresponds one (or more) value (values) or state (states) of the other. Any two corresponding values or states are said to constitute a pair of values or states, and any two functionally related variables may be called a function-pair. Examples of such function-pairs abound on every hand, as the radius and the area of a circle; the corresponding values of x and y in an equation, 2x-3y+5=0; elasticity of medium and velocity of sound or other undulation; the amount of sodium chloride formed and the time occupied by the reaction that generates it; the prosperity of a given community and, ceteris paribus, the intelligence of its patriotism. Indeed it may be that there is no thing which is not in some sense a function of every other. Be this as it may, one thing is very certain, namely, a very great part, if not the whole, of our thinking is pri-marily concerned with functional relationships, deals, that is, immediately or mediately with pairs or systems of corresponding values or states or changes. Behold, for example, how the parallelistic psychology searches for corre-lations between psychical and physical phenomena Witness, too, the sociologist seeking to determine a law of correspondence between the homogeneity of a population and its peacefulness; the anthropologist attempting to find a formula correlating mental power and brainweight; the physicist's determinations of dependence between pressure and volume of a gas; and so on and so on. It is, then, here, in the immense and wondrously diversified domain of correspondence, the answering of value to value, of change to change, of condition to condition, of state to state, that the knowing activity, the intellect, finds its field.

What is it precisely that we seek to do by means of a correlation? The answer is: when one or more facts are given or known, to pass with absolute certainty to the correlative fact or

facts For example, if $y = \sin x$, then, if a value be assigned to x or y, the corresponding value or values of y or x are determined by the equation, or definition, of the functional correspondence between the assemblage of values which x may take and the assemblage that y may assume. To effect the desired transition from the given or known to the dependent ungiven or unknown obviously requires one or more formulæ or equations which shall serve to define precisely the manner of correspondence, the law of dependence Where do such defining formulæ or equations come from? Strictly speaking, they are never found, they are always assumed, assumed immediately or else mediately, that is, in the latter case, derived by assumed logical processes from such as belong to the former case This statement is valid in every field of logical thought. In every field it is true that from nothing assumed nothing can be derived. Now, nothing is easier than to write down a perfectly definite formula that does not tell how cheerfulness depends on climate or retentiveness on interest or the volume of a cube on its dimensions The mentioned inapplicability or "inutility" does not, however, at all tend to invalidate the formula regarded as defining a certain law of correlation. Indeed a given formula may be per-fectly intelligible in itself; it, alone or joined with others in similar case, may state a perfectly intelligible law of correspondence, which, nevertheless, may have no validity whatever in the physical or in the sensuous universe What is it, then, that guides in the choice of for-mulæ? For such determination or choice seems hardly referable to chance alone. The answer is that, broadly speaking, choice is determined by curiosity, and curiosity is itself not determined by choice, but is rather matter of native gift or predilection.

Just here we are in position where we have only to look steadily a little in order to perceive clearly the sharp and ultimate distinction between mathematics, on the one hand, and physical or other science, on the other. These are discriminated according to the kind of curiosity whence they spring. The matheof curiosity whence they spring. The mathematician is curious about definite abstract relationships, about logically possible modes of order, about varieties of abstract implications, about completely determined or determinable functional relationships considered solely in and of themselves, that is, without the slightest concern about the question whether or no they have external or sensuous or other sort of validity than that of being logically thinkable. It is the aggregate of logically thinkable relationships that constitutes the mathematician's universe, an indefinitely infinite universe, worlds in worlds of worlds in worlds of wonders, inconceivably richer in mathetic content than can be any outer world of sense Immense indeed and marvelous is our own world of sense with its rolling seas and stellar fields and undulating ether. But compared, one need not say with the entire world of mathesis, but only with the hyperspaces (see Hyperspaces) explored by the geometrician, the whole vast region of the sensuous universe is literally as a merest point of light in a shining sky.

Now this mere speck of a physical universe, in which the chemist, the physicist, the astrono-

mer, the biologist, the sociologist, and the rest of nature students, find their great fields, may be, as it somewhat seems to be, a realm of invariant uniformities or laws; it may be a mechanically organic aggregate, connected into an order whole by a tissue of completely definable functional relationships; and it may not. In other words, it may be that the universe eternally has been and is a genuine cosmos, that the external sea of things immersing us, although it is ever changing infinitely, changes only lawfully, in accordance with a system of immutable laws, constituting an invariant (see Invariants and Covariants) at once underived and indestructible and securing everlasting harmony through and through; and it may not be such. The student of nature assumes, he rightly assumes, that it is, and, moved and sustained by appropriate curiosity, he endeavors to find in the outer world what are the elements and relationships assumed to be valid there. "Natural science," said Bernhard Riemann, "is the attempt to comprehend nature by means of exact concepts." The mathematician, as such, does not make that assumption and does not seek for relationships in the outer world.

Is the assumption correct? Undoubtedly it is admissible, and as a working hypothesis it is undoubtedly very useful or even indispensable to the student of external nature; but is it true? The mathematician, as man, does not know although he greatly cares. Man, as mathematician, neither knows nor cares The mathematician does know, however, that, if the assumption be correct, every relationship that is valid in nature is, in abstractu, an element in his domain, a subject for his study. He knows, too, at least he strongly suspects, that, if the assumption be not correct, his domain remains the same absolutely. The two realms, of mathematics, of natural science, like the two attitudes, the mathematician's and that of the nature student, are fundamentally distinct and disparate. To think logically the logically thinkable—that is the mathematician's aim. To assume that nature is thus thinkable, an embodied rational logos, and to discover the thought supposed incarnate there—these are at once the principle and the hope of the student of nature.

Suppose the latter student is right, suppose the outer universe really is an embodied logos of reason, an infinitely intricate garment ever weaving and ever woven, warp and weft, of logically determinate relationships, does that imply that all of the logically thinkable is incorporated in it? It seems not. A cosmos, a harmoniously ordered universe, one that through and through is self-compatible, can hardly be the whole of reason materialized and objectified. There appears to be many a rational logos. At any rate the mathematician has delight in the construction and contemplation of divers systems that are inconsistent with one another, though each is composed of consistent relationships. He constructs in thought, as witness the geometry of hyperspaces, ordered worlds, worlds that are possible and logically actual, and he is content not to know if any of them be otherwise actual or actualized. There is, for example, a Euclidean geometry and there are infinitely many kinds of non-Euclidean (see Non-Euclidean (see

regarded as "applied" mathematics, regarded, that is, as true descriptions of some one actual space, are incompatible. In our universe, to be specific, if it be, as Plato thought and nature science takes for granted, a geometrized or geometrizable affair, then one of these geometries may be objectively valid in it. But in the vaster world of thought, in the world of pure mathesis, all of them are valid; there they coexist, and interlace among themselves and others as differing strains of a hypercosmic harmony.

A geometry, indeed any mathematical theory, consists of a definite system of determinate compatible principles or assumptions or hypotheses or postulates (commonly called axioms) together with their implications, their logically deducible consequences Accordingly, natural science, the term being broadly employed to signify knowledge that is ultimately dependent upon "observation and experiment," cannot be or become strictly mathematical transfer or become strict matical. It aspires to the character, and approximates and imitates the form, of mathematics, but it can never really attain either. Mathematics is concerned with implications, not applications Such terms as "applied mathematics," "mathematical physics," and the like, are indeed in common use, but the signification, rightly understood, is always that of a mixed doctrine, a doctrine that is thoroughly analyzable into two disparate parts: one of these consists of determinate concepts formally combined in accordance with the established canons of ratiocination, ie, it is pure mathematics and not natural science; the other is matter of observation and experiment, i.e., it is natural science and not mathematics. No fibre of either component is a filament of the other. Whether the behavior of natural phenomena is or is not exactly descriptible by mathematical formulæ can never be ascertained, for the means to "natural knowledge," viz, observation and experiment, are fallible by nature, and, however refined or prolonged, are incapable of yielding absolute exactness or certainty. Of any so-called law of nature, "the most, the last, the best that can be said" is that its agreement with the facts is so nearly perfect that every discrepance, if any there be, has escaped detection.

Cannot the like be said of mathematics? In the foregoing conception of mathematics it has indeed been tactily assumed that some ideas are completely determinable, that there are possible systems of postulates absolutely free alike from obscurity and from interior contradiction, that the postulates of such a system import a perfectly definite body of ascertainable implications, and that there is a perfect standard of logic quite independent of time and place and of the defects and idiosyncrasies of individual reasoners. May not these assumptions, some or all of them, be incorrect? There are some grounds, historical and biological, for suspecting that such may be the case Such an admission, however, whether tentative or unconditioned, has by no means the effect of undefining mathematics or of dethroning the science from its commanding position among the knowledges. It would indeed leave man without the possession, even without the hope, of absolute knowledge, but, among all the forms of actual or potential proximate knowledge, mathematics would still rightly rank as highest. It would indeed be marked by a degree of uncertainty or indeterminateness or relativity or inexactness, viz., that degree of inexactness which by supposition would belong to all meanings and standards. Hence it would not be peculiar to mathematics, but would be common to it and every other science. But every such cother science has an additional mark of indeterminateness, the characteristic inexactness of all possible observation and experiment. In any case, then, the observational and experimental sciences are, in respect to certainty and exactness, hopelessly inferior to mathematics.

But in all ages it has been the faith of the mathematician that complete determination of concepts and absolute rigor of demonstration are in fact attainable, not, however, in the realm of observation and experiment, but in the world of pure thought. It is, then, in that world, where all entia dwell, where is every type of order and every manner of correlation and every variety of relationship and every form of implication, it is in this infinite ensemble of eternal verities whence, if there be one cosmos or many of them, each derives its character and mode of being,— it is there that the spirit of mathesis has its home and its life.

Is it a restricted home, a narrow life, static and cold and gray with logic, without artistic interest, devoid of emotion and mood and

sentiment?

That world, it is true, is not a world of solar light, it is not clad in the colors that glorify the things of sense, but it is an illuminated world, and over it all and everywhere throughout are hues and tints transcending sense, painted there by radiant pencils of psychic light, the radiance in which it lies.

It is a silent world. Nevertheless, in respect to the highest principle of art—the interpenetration of content and form, the perfect fusion of mode and meaning—it even rivals

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In a sense, it is a static world, like those of the sculptor and the architect The figures, however, which reason constructs and the mathetic vision beholds, transcend the temple and the statue, alike in simplicity and in intricacy, in delicacy and in grace, in symmetry and in poise.

Not only are this home and this life, thus rich in æsthetic interests, really controlled and sustained by motives of a sublimed and supersensuous art, but the religious aspiration, too, finds there, especially in the beautiful doctrine of invariants, the most perfect symbols of what it seeks — the changeless in the midst of change, abiding things in a world of flux, configurations that remain the same despite the swirl and stress of countless hosts of curious transformations.

Literature.— The literature having for its object the exposition of the nature and principles of mathematics is extensive By far the most important recent contribution, which at the same time serves to introduce the reader to the chief memoirs in the field, is B Russell's 'The Principles of Mathematics,' Vol. I. For an excellent critical review of the principal modern attempts to define mathematics, the reader may be referred to Prof. M Bôcher's 'The Fundamental Conceptions and Methods of Mathematics' ('Bull of the American Math Soc.,' Vol. XI). Consult also Whitehead,

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A. N, and Russell, B. A. W, 'Principia Mathematica' (Cambridge 1910-); Whitehead, A. N, 'Introduction to Mathematics' (Home University Library).

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Adrain Professor Emeritus of Mathematics, Columbia University.

MATHER, math'er, Cotton, American colonial clergyman, son of Increase Mather (qv) b Boston, 12 Feb 1663; d. there, 13 Feb. 1728. He entered Harvard College at 11, and at his graduation in 1678 President Oakes expressed his expectation that he would resemble Richard Mather, who should be united and flourish again in him. He was early distinguished for piety, and in his 14th year began a system of rigid and regular fasting and vigils which he continued through life He was occupied after leaving college with teaching, in 1680 became the assistant of his father in the pastorate of the North Church, Boston, and in 1684 was ordained as his colleague. When, at the report of the landing of the Prince of Orange in England, Governor Andros was seized and imprisoned in Boston, Cotton Mather prepared the public declaration justifying the measure. But it is in connection with proceedings concerning witchcraft that he is most generally known. In 1685 he published his 'Memorable Providences relating to Witchcraft and Possessions,' narrating cases which had occurred at intervals in different parts of the country; and during the witchcraft excitement in Salem in 1692 was a prejudiced investigator in the matter, publishing the next year his 'Wonders of the Invisible World,' in order to confirm believers in that kind of demoniac possession. In 1702 appeared his greatest work, 'Magnalia Christi Americana,' an ecclesiastical history of New England concerning which he was admitted to know more particulars than any other man. Though strongly marked by his partialities and prejudices, its somewhat quaint and grotesque character, its admixture of superstition, learning and ingenuity, make it still interesting. In 1713 his 'Curiosa Ameri-cana' was read before the Royal Society of London, and he was elected a member of that body, being the first American to receive this distinction In its 'Transactions' in 1721 appeared an account of the practice of inoculation for the smallpox, introduced by Lady Mary Wortley Montagu; and it was by the efforts of Mather in connection with Dr Boylston, against both professional and popular prejudice, that the operation was first performed in Boston. His 'Essays to Do Good' (1710) was admitted by Dr. Franklin to have influenced some of the principal events of his life; and his 'Christian Philosopher' and 'Directions for a Candidate of the Ministry' en-joyed high repute. His 'Parentator' (1724) is a life of his father, Increase Vain and pedantic as he was and narrow and credulous as he showed himself to be in regard to witchcraft and other topics of his time, he was in many directions a useful, public-spirited citizen who deserves to be regarded more leniently by pos-terity than has sometimes been the case Conterity than has sometimes been the case Sult (Life) by Samuel Mather (Boston 1729); Pond, Enoch, 'The Mather Family' (ib. 1844); Marvin, A. B., 'Life and Times of Cotton

Mather' (ib. 1892); Wendell, Barrett, 'Cotton Mather' (1891); Tyler, 'History of American Literature' (Vol. II, New York 1881).

MATHER, Frank Jewett, Jr., American professor of art: b. Deep River, Conn, 6 July 1868 In 1889 he was graduated at Williams College, and subsequently studied at Johns Hopkins (Ph D 1892), the University of Berlin and L'École des Hautes Études, Paris. From 1893 to 1900 Dr. Mather was instructor and assistant professor of English and Romance languages at Williams College; was editorial writer on the New York Evening Post, assistant editor of The Nation in 1901–06; art critic of the Evening Post in 1905–06 and again in 1910–11 and American editor of the Burlington Magazine in 1904–06 In 1910 Dr Mather became Marquand professor of art and archæology at Princeton University. He is the author of 'Homer Martin, Poet in Landscape' (1912); 'Estimates in Art' (1916), 'The Portraits of Dante' (1921); 'A History of Italian Painting' (1923) 'Modern Painting' (1927), also several monographs He is a contributor to various periodicals. In 1917 he served as chief boatswain's mate in the United States Naval Reserve Fleet.

MATHER, Increase, American colonial divine, son of Richard Mather (q.v.): b. Dorchester, Mass, 21 June 1639; d. Boston, 23 Aug. 1723. He was graduated at Harvard College in 1656, and in 1658 at Trinity College, Dublin. He afterward preached in Devonshire and the island of Guernsey, and on the Restoration was urged to conform and settle in England; but he refused, and on his return to Boston was invited to preach to the North Church, of which he was ordained pastor in 1661. This office he held for 62 years. He was a member of the synod of 1679, and drew up the propositions which were adopted concerning the proper subjects of baptism. In 1681 he was elected president of Harvard College, but the reluctance of his church to relinquish him induced him to de-cline the position. In 1684 the office was again offered him, and he accepted it with a stipulation that he should retain his relation to his people. He continued in this station till 1701, when he retired in consequence of an act of the general court requiring the president to reside in Cambridge. He received the first diploma for the degree of D.D. that was granted in America. When in 1683 Charles II demanded that the charter of Massachusetts should be resigned into his hands, Mather was foremost in opposing the measure; and when that monarch annulled the charter in 1685, he was sent to England as agent for the colonies. He was in England during the revolution of 1688, and, having found it impossible to obtain a restoration of the old charter, accepted a new one, under which the appointment to all the offices reserved to the Crown was confided to him. He returned in 1692, when the general court appointed a day of thanksgiving for his safety and for the set-tlement of the dispute. He is stated to have condemned the violent proceedings which followed relating to witchcraft. He was accustomed to spend 16 hours every day in his study, and always committed his sermons to memory. One-tenth part of all his income was devoted to purposes of charity. He was the author of 92 distinct publications. His 'Remarkable

Providences' was republished in the 'Library of Old Authors' (1856), and other works by him are 'A Brief History of the War with the Indians in New England' (1676); 'Relation of Troubles of New England from the Indians' (1677, 1864); 'Cases of Conscience Concerning Witchcraft' (1693; 1862), 'Cometographia, or a Discourse Concerning Comets' (1683) Consult Pond, Enoch, 'The Mather Family' (Boston 1844); Walker, Williston, 'Ten New England Leaders' (New York 1901); Tyler, M C, 'History of American Literature' (Vol II, New York 1881), Sibley, 'Harvard Graduates' (Vol I, Cambridge 1873)

MATHER, Richard, American colonial divine b Lowton, Lancashire, England, 1596; d Dorchester, Mass, 22 April 1669 He became a schoolmaster at Toxieth Park, near Liverpool, at the age of 15; studied at Brazenose College, Oxford, in 1618, was ordained in the English Church soon after, and became the minister of Toxieth, in which position he remained 15 years He was suspended for non-conformity to the ceremonies of the Established Church in 1633, and though soon restored by the influence of friends was again silenced in the following year. He therefore decided to emigrate to New England, arriving in Boston in August 1635. The next year he became pastor of the church in Dorchester, and held that position till his death He was one of the compilers of the 'Bay Psalm Books' and assisted to frame in 1648 a model of discipline known as the Cambridge Platform He married for his second wife the widow of John Cotton (qv) His 'Journal, Life and Death' was issued by the Dorchester Historical Society in 1850. See Congregationalism and consult Mather, Increase, 'Life and Death of Richard Mather' (Cambridge 1670); Tyler, M. C, 'History of American Literature' (Vol. II, New York 1881).

MATHER, Robert, American lawyer and railroad official b. Salt Lake City, 1859, d. 1911. In 1882 he was graduated at Knox College, Illinois, and four years later was admitted to the bar at Chicago. He practised in that city in 1886–89; was local attorney in 1889–94, assistant general and general attorney in 1894–1902, and general counsel in 1902–09 of the Chicago, Rock Island and Pacific Railroad. In 1909 he was elected chairman of the board of the Westinghouse Electric Company. Mr. Mather was interested, as officer or director, in several railroad and industrial companies.

MATHER, William Williams, American geologist: b. Brooklyn, Conn, 24 May 1804; d. Columbus, Ohio, 26 Feb. 1859 He was graduated from West Point in 1828 and was an assistant professor of chemistry and geology there, 1829–35. After a short period spent as professor of chemistry at the University of Louisiana (1836), he undertook the superintendence of a geological survey of the 1st district of New York State which included the Hudson River counties, a labor which lasted from 1836 to 1844. He was also State geologist of Ohio 1837–40, and of Kentucky 1838–39, and from 1842-45, and 1847–50, professor of natural science in the Ohio University at Athens. He made a collection of about 22,000 mineralogical specimens. He contributed frequently to scientific journals, edited the Western Agricultursst for a time and published 'Geology of the 1st

Geological District' (in 'Natural History of New York,' 1843); and 'Elements of Geology'

MATHESON, math'e-son, Arthur James, Canadian statesman: b Perth, Ontario, 1842; d 1913. He received his education at Upper Canada College and Trinity College, Toronto; was called to the bar in 1870 and established a practice in his native town of which he was mayor in 1883-84. From 1894 to 1913 he was a member of the Conservative party in the Ontario legislature and served as provincial treasurer in 1905-13 under Premier Sir James P. Whitney. In 1906 he was a member of the Ottawa Inter-provincial Conference and in the following year of the National Conference on Taxation. In 1910 he served as vice-president of the International Commission. Mr. Matheson was made K.C. in 1908. He served in the militia after 1866, saw service during the Fenian raids and in 1900 attained the rank of brigadier-general

MATHESON, George, Scottish Presbyterian clergyman b Glasgow, 27 March 1842; d. 28 Aug 1906. He was educated at Glasgow University and although he had lost his sight in boyhood he entered the ministry of the Kirk of Scotland and was ordained in 1868. He was minister of Innellan on the Firth of Clyde 1868-86; and of Saint Bernard's Parish, Edinburgh (1886-97). He was the author of the famous hymn, O Love that Will Not Let Me Go, which finds a place in nearly every modern hymnal. Among his many published books are 'Aids to the Study of German Theology' (1874); 'Natural Elements of Revealed Theology' (1881); 'The Psalmist and the Scientist' (1887); 'Sidelights from Patmos' (1897); 'The Sceptre Without a Sword' (1901); 'Representative Men of the Bible' (1907).

MATHESON, Samuel Pritchard, Canadian clergyman. b Manitoba (then the Red River Settlement), 20 Sept. 1852. He received his education at Saint Johns' College School and Saint John's College, Winnipeg. He received deacon's orders in the Anglican Church in 1875 and those of priest in 1876. He became master at Saint John's College School; subsequently served as professor of exceptical theology at Saint John's College, canon and dean of Saint John's Cathedral, deputy headmaster and headmaster of Saint John's College. He became secretary of the Provincial Synod of Rupert's Land and prolocutor of same and in 1902 became prolocutor of the General Synod of Canada. In 1903 he became coadjutor bishop of Rupert's Land, in 1905 he became archbishop and from 1909-30 was Primate of all Canada. D. 19 May 1942.

MATHEW, Theobald, known as "FATHER MATHEW," Irish temperance reformer b. Thomastown Castle, County Tipperary, Ireland, 10 Oct. 1790; d. Queenstown, Ireland, 8 Dec 1856 He was educated at Maynooth College and the Capuchin Convent, Cork, and was ordained to the Roman Catholic priesthood in 1814. In 1838 he inaugurated a temperance crusade and his labors in Great Britain and Ireland induced nundreds of thousands to significantly the statement of the sense of the total abstinence pledge. The most conclusive evidence of the benefit of his preaching

was the reduction of nearly £600,000 on the duties of spirits imported in Ireland in five years. He made a tour of the United States in 1849–51 and was very successful. Though pensioned by the Queen he was never entirely relieved from the burden of debt with which his extended tours had burdened him, and which caused his imprisonment for a time in 1847. Consult Life by J. F. Maguire (London 1863; abridged ed., 1890); Matthew F, Father Mathew His Life and Times (London 1890); Tynan, K, Father Mathew (ib. 1908).

MATHEWS, math'ūz, Abert, "Paul Siegvolk," American lawyer and author: b New York, 8 Sept. 1820; d there, October 1903. He was graduated from Yale in 1842 and after studying law was admitted to the New York bar in 1845. He soon acquired an extensive practice and was especially skilled in chancery practice. He found time for literary work despite the claims of his profession, and under the pseudonym "Paul Siegvolk" published Walter Ashwood, a once popular love story (1860); A Bundle of Papers (1879); Thoughts on Codification of the Common Law (1881); Ruminations: The Ideal American Lady and Other Essays (1892); A Few Verses (1893), etc. In the early part of his career he was a close friend of N. P. Willis, whom he aided in establishing The Home Journal

MATHEWS, Charles, English actor: b. London, 28 June 1776; d. Plymouth, England, 28 June 1835. He made his debut as an actor in Richmond in 1793 and was subsequently engaged for some years in Dublin and London. In 1818 he made a hit as a professional entertainer in his At Home. He continued in this class of work, making two successful trips to the United States and, returning, presented in England with great success A Trip to America In 1828 he became joint proprietor of the Adelphi Theatre, London. Consult Baker, Our Old Actors (London 1881); Mrs Mathews, Memours of Charles Mathews, Comedian (London 1839)

MATHEWS, Charles James, English actor: b. Liverpool, 26 Dec. 1803; d. Manchester, England, 24 June 1878. He was the son of Charles Mathews (qv.) and was educated as an architect, but abandoned that calling for the stage. As a light comedian he was very successful, but his attempts at managing Covent Garden and the Lyceum Theatre in London were failures. He made several trips to the United States, Paris and Australia, presenting an entertainment similar to his father's famous At Home Consult Dickens, Charles, Life of Charles James Mathews (London 1879).

MATHEWS, Edward Bennett, American geologist: b. Portland, Me., 16 Aug. 1869. In 1891 he was graduated at Colby College and in 1894 received the degree of D.Ph. at the University of Johns Hopkins. In 1891–94 he was field assistant of the United States Geological Survey; in 1894–95 was instructor in mineralogy and petrography, in 1895–99 associate, in 1899–1904 associate professor and in 1904 professor of geology at Johns Hopkins. After 1917, he served as chairman of the geological department. From 1898 to 1917 Dr. Mathews was assistant state geologist of Maryland and subsequently was state geologist. He pub-

hshed Bibliography and Cartography of Maryland (1897); Maps and Map-Makers of Maryland (1898); Building Stones of Maryland (1898); Limestones of Maryland (1910); History of the Mason-Dixon Line; Physical Features of Maryland, Water Resources of Maryland, and numerous geological papers. Died Baltimore, Md., 4 Feb. 1944.

MATHEWS, Ferdinand Schuyler, American artist and author. b New Brighton, N.Y., 30 May 1854; d. 20 Aug. 1938. He contributed extensively to the magazines both as illustrator and writer and published The Writing Table of the 20th Century (1900); The Field-Book of American Wild Flowers (1902); Field-Book of Wild Birds and Their Music (1904); Field-Book of American Trees and Shrubs (1915); Wild Flowers for Young People (1923).

MATHEWS, Joseph Howard, American chemist. b Auroraville, Wis, 15 Oct. 1881. He was graduated from the University of Wisconsin in 1903, and took his Ph.D. at Harvard in 1906. In 1906-07 he was an instructor in chemistry at the Case School of Applied Science, Cleveland, Ohio. In 1911 he joined the faculty of the University of Wisconsin as assistant professor of chemistry. He was made associate professor in 1917, and professor in 1919, also chairman of the department. He served in the Ordnance Department of the United States Army during the First World War.

MATHEWS. Shailer. American educator

MATHEWS, Shailer, American educator and editor: b Portland, Me., 26 May 1863; d. Chicago, Ill, 23 Oct. 1941. After being graduated from Colby College in 1884 and from Newton Theological Institution in 1887, he studied at the University of Berlin, 1890-91. He taught rhetoric and thereafter history and political economy, at Colby College, 1889-94; and in the latter year joined the faculty of the Divinity School of the University of Chicago, where he was professor of history and comparative theology, 1906-33, junior dean, 1899-1908, and dean, 1908, until he retired as emeritus in 1933. Honorary degrees were conferred on him by Colby, Pennsylvania, and Oberlin colleges, and by Brown, and Miami universities, the University of Glasgow, Faculté Libre de Theologie Protestante de Paris, the Chicago Theological Seminary, and the University of Rochester. Dr. Matheway and Special Seminary and the Chicago Theological Seminary, and the University of Rochester. Mathews was president of the Federal Council of the Churches of Christ in America, 1912–16; of the Northern Baptist Convention, 1915; of the Chicago Church Federation, 1929–32; and of Kobe College Corporation after 1920. He was also a trustee of the Church Peace Union, founded by Andrew Carnegie, after 1914; and was active in numerous other organizations. He delivered the Haverford Library lectures in 1907; the Earle lecture at Berkeley, Calif., in 1913; the William Belden Noble lectures at Harvard in 1916; the McNair lectures at the University of North Carolina in 1918; the Slocum-Bennett lectures at Wesleyan University in 1921; the Cole lectures at Vanderbilt University in 1926 and 1934; and the Barrows lectures in India, and 1934; and the Barrows lectures in India, University of Chicago, 1933–34. He edited World To-day from 1903–11, and The Biblical World, 1913–20. He was also the editor of New Testament handbooks, The Bible for Home and School, Social Betterment, handbooks of ethics and religion, Women Citizen's Library and associate editor of the Dictionary of the Bible, American Journal of Theology, Constructive Quarterly. His works include Select Mediaeval Documents (1891; 1900), The Social Teaching of Jessis (1897); A History of New Testament Times in Palestine (1899); Constructive Studies in the Life of Christ, with E D. Burton (1901); The French Revolution—A Sketch (1901); Principles and Ideals for the Sunday School, with E D Burton (1903), The Messianic Hope in the New Testament (1905); The Church and the Changing Order (1907); The Social Gospel (1909); The Gospel and the Modern Man (1909); The Spritial Interpretation of History (1916); The French Revolution, 1789–1815 (1922); Validity of American Ideals (1922); The Faith of Modernism (1924); The Atonement and the Social Process (1930).

MATHEWS, William, American author: b. Waterville, Maine, 28 July 1818; d Boston, Mass, 14 Feb. 1909. He studied law at Harvard and was admitted to the bar in 1838, practicing for a time in Waterville, but abandoned law for journalism, establishing the Watervillonian in 1841, which later he named the Yankee Blade. In 1859-62 he was engaged in journalism in Chicago. In 1862 he was appointed professor of English and rhetoric at the University of Chicago, but in 1875 resigned in order to devote himself exclusively to literature. Among his books are Getting on in the World (1873); The Great Conversers (1874); Words Their Use and Abuse (1876); Oratory and Orators (1870); Literary Style (1881); Men, Places and Things (1888); Wit and Humor: Their Use and Abuse (1888), Nugae Literariae (1896); Conquering Success (1903), etc.

MATHEWS, William Smythe Babcock, American musical writer and editor. b Loudon, N.H., 8 May 1837; d. 1912. He obtained his musical education in Boston and became a teacher in 1853; he was for a time engaged at the Wesleyan Female Seminary in Georgia, but in 1867 he removed to Chicago, where he was prominent as an organist and engaged in editorial work and criticism of music on the leading Chicago papers. In 1891 he established the magazine, Music, and edited it until 1903, when it became a part of the Philharmonic. He was author of Outlines of Musical Form (1867); Emerson Organ Method (1870); How to Understand Music (1880–88); Music and Its Ideals (1897); Dictionary of Musical Terms (1895); Popular History of Music (1901); The Great in Music (1900–03), etc.

MATICO (piper angustifolium), a shrub of the natural order Piperaceae, native of Peru; remarkable for the styptic property of its leaves and unripe fruit, used for stanching wounds.

MATIN, a large houndlike French dog, resembling the Great Dane, but having a rough coat. The head is elongated, the forehead flat, the ears pendulous toward the tips; color, yellowish-fawn or whitish. It is commonly employed in France as a sheep-dog and watchdog.

MATINS, the daily office of morning prayer in the Anglican communion. It is composed in part of the pre-Reformation offices of Matins and Lauds In the Roman Catholic Church, the first portion of the Divine Office,

with which Lauds are usually associated. On Sundays and double feasts matins have three nocturns; on simple feasts and week-days, one nocturn. Easter and Pentecost have each only one nocturn, with three psalms. After private prayer versicles and responses are recited; the invitatory psalm follows.

MATISSE, Henri, French artist: b at Cateau, 31 Dec 1869 He was educated at the École des Beaux-Arts, and is somewhat radical in his tendencies, especially in his treatment of light He spent some time in Morocco but has lived in Southern France He is particularly successful in delineating still life and landscapes.

MATRIARCHATE, position or power of a matriarch, a name formerly given to the wife of a patriarch Among the Indians the mother is considered of superior importance in families, clans or tribes. Job's wife, Xantippe, and others in history have been called matriarchs. In certain primitive tribes the mother, in line of descent and inheritance, takes precedence of the father Consult Bachofen, J. J., Das Mutterrecht (2d ed., Basel 1897); Westermarck, E. A., History of Human Marriage.

MATRIMONY VINE. See LYCIUM.

MATRIX MECHANICS. See QUANTUM THEORY—Modern Developments.

MATRONALIA, the 1st of March, the New Year's day of the Roman religious calendar, sacred to Juno, the deity of matrons. On this festival day wives expected presents from their husbands, and themselves gave an entertainment to the household slaves. Consult Fowler, W. W., Roman Festivals (London 1899).

MATSUDAIRA, mah-tsu-digh'rah, the generic name of 52 families of territorial nobles in feudal Japan, mostly, although not all, descended from an ancestor Minamoto Chikauji of the 14th century, 11th in generation from Yoshiyé who, in the village of Matsudaira, in Mikawa, espoused the daughter of Matsudaira Nobushige and took his wife's name When, in Yedo in 1604, the Tokugawa line of shoguns was established, permission was given to the heads of allied or loyal clans to bear his name. Among the hundreds of feudal barons and others thus favored have been many of the most illustrious in the period 1604-1868. After this date, the name, with the privilege of bearing the ancestral coat of arms, was restricted to 27 families, which now comprise a marquis, 3 counts, 22 viscounts and 1 baron. Their heraldic crest consists of three mallow leaves within a circle. With the exception of Fujiyama, this is the most characteristic decoration seen on the older Japanese art products. It is said to have been selected by Iyeyasu, when by a loyal vassal three cakes, laid over as many mallow leaves, on a plate, were presented for the conqueror's refreshment. Consult Dixon, Japan (1869); Griffis, The Mikado's Empire (1912), and La Tourette, The Development of Japan (1918).

MATSUDAIRA SHUNGAKU, mah-tsu-digh-rah shoon'gah-ku, champion, during Japan's hermit days, of Western civilization and of friendship with the United States. b. Yedo, 11 Oct. 1828; d. Tokyo, 1880. Adopted at 10 years of age by Matsudaira, baron of Echizen, at 21 he began sweeping and cor-

structive reforms, introducing modern military, economic and hygienic methods, abolishing archery in favor of fire arms, establishing cannon and rifle factories, sending young men as students to the Dutch at Nagasaki, establishing lectures on the Oyoméi (qv) philosophy and writing manifestoes He combatted popular prejudices, showed the superiority of Western civilization and the reasonableness of Christianity, compelled the use by doctors of the Western methods of medical practice, opened a dispensary and organized a foreign literature department in the excellent clan school in Fukui Opposed to opening the country prematurely, on unequal terms, as was done by II Naosuké, he suffered domiciliary confinement but was later called to be virtual premier of the empire With the assistance of Yokoi Héishiro he abolished the century-old custom of compelling the feudal barons to live half the year in Yedo, leaving their families as hostages when away This made Kioto the centre of affairs. He later brought the first of the yatio in his domain, and here the first public schools beyond the treaty ports were organized, and one of the very first of the new regiments of the peasant national army was raised. Out of this region, chiefly, was raised the famous Ninth Division that took Port Arthur High posthumous honors were awarded this pioneer of Western civilization. His biography and writings have been compiled by his son the marquis. Consult Griffis, 'The Mikado: Institution and Person' (1915), and 'The Mikado's Empire' (1912)

MATSUKATA, Masayoshi, PRINCE, Japanese statesman: b. Satsuma 1835; d. Tokio, 2 July 1924. He was son of a Samurai, but fell in with the Radical party; was made head of the prefecture (or ken) of Hida after the revolution; was prominent in the tax reform of 1875; represented Japan in several industrial exhibitions; was a member of the Cabinet, in 1880 as Minister of Commerce, in 1881 as Minister of Finance, and, with the same portfolio, as Prime Minister from 1891 to 1893 His great work was in 1896-97, when he formed a new cabinet, carried through the gold standard, set Japanese credit on its feet, but he was forced to retire because of the ill-success of his scheme of taxation. He was Minister of Finance a second time in 1898-1900, became Privy Councillor in 1903, and received the title fmarquis in 1906 He was also president of the Japanese section of the Red Cross

MATSUMOTO, Japan, town, in the district of Nagano, in the island of Hondo, 100 miles north by west of Tokio The town manufactures baskets, preserved fruits and silks and has an old daimyo castle. Pop. 63,427.

MATSUMURA, Jinzo, Japanese botanist: b. Ibaraki-Ken, 1856. In 1886-88 he studied at the universities of Wurzburg and Heidelberg, meanwhile holding the assistant professorship of botany in the University of Tokio to which he had been appointed in 1883. He became full professor in 1890 and seven years later was appointed director of the Botanical Gardens. He collaborated in Brinkley's 'Japanese-English Dictionary' (1896) and published 'Nomenclature of Japanese Plants in Latin, Japanese and Chinese' (1884); 'Names of Plants and their Products in English, Japanese and Chinese'

(1892); 'Conspectus of Leguminosæ' (1902); 'Index Plantarum Japonicarum: Cryptogamæ' (1904); 'Phanerogamæ' (1905); 'Tentamen' Floræ Lutchuensis,' with Ito (1899); 'Revisio Alni Specierum Japonicarum' (1902); 'Enumeratio Plantarum in Insula Formosa Sponte Crescentium' (1906); 'Chinese Names of Plants' (1915); 'Classified Etymological Vocabulary of the Japanese Language Ancient and Modern' (1915); 'Vocabulary of Yamato' (1921).

MATSUSHIMA, Japan, village on the northeast coast of the Island of Hondo, situated on the Bay of Sendai. In a lagoon opposite the village are 808 islets ranging in elevation from 30 to 300 feet and covered with pines. This beautiful natural garden is one of the wonders of Japan.

MATSUYAMA, Japan, town and capital of the district of Ehime, on the island of Shikoku, five miles from Mitsu It contains a great feudal castle, one of the few perfect specimens of its period in modern Japan. Pop. (1925) 58,292.

MATSUYE, or MATSUE, Japan, town and capital of the district of Shimane, on the island of Hondo, 140 miles north by west of Kioto. It has large paper manufactories and agate-polishing establishments and has numerous temples. It is well built and is one of the cleanest towns in Japan. Pop. 36,209.

MATSYS, mat-sīs', or MASSYS, Quentin, Flemish painter: b. Antwerp or Louvain, about 1460, d. there, between 13 July and 16 Sept. 1530. A blacksmith until he was 20, legend says that he turned artist to win the love of a painter's daughter He was acquainted with many of the notables of the day, including Durer, Erasmus and Sir Thomas More. Much of his present fame is due to genre pictures, especially of misers and money-changers, which are not his work, but that of his school, among them his son Jan, whose 'Misers' is at Windsor Castle. Matsys' own work is styled a connecting link between Van Eyck and the later Dutch realists, apart from such excellent portraits as those of Maximilian of Austria and Petrus Aegidius, it is mostly religious in theme. The 'Burial of Christ,' an altarpiece for the Antwerp Cathedral, now in the Antwerp Museum, and the 'Story of Saint Anne,' now in the Brussels Gallery, are the best examples of his work. The Metropolitan Museum, New York, contains his 'Adoration of the Kings.' Consult Cohen, Walter, 'Studien zur Quentin Metsys' (Bonn 1904) and de Bosschère, Jean, 'Quentin Metsys' (Paragle 1907) Metsys' (Brussels 1907)

MATTAWA, or MATTAWAN, Canada, town in the Nipissing district of Ontario province, situated at the confluence of the Mattawa and Ottawa rivers at the east end of Lake Timiskaming, on the Canadian Pacific Railroad, 38 miles east of North Bay on the Trans-Canada Highway. The town has extensive lumber interests, and hardwood blocks for the manufacture of airplane propellers are produced here. It is also famous as the starting point of hunters and anglers in the vicinity. Pop. (1931) 1,631.

MATTAWA, a river of Ontario, the source of which is Trout Lake, east of Lake Nipissing. It flows east a distance of about 45 miles and enters the Ottawa River at Mattawa, 308 miles from Montreal. This river forms part of an almost continuous water-way from the Ottawa

River to Lake Huron, and before the Canadian Pacific Railroad was built this water route was much used for transportation and travel.

MATTEAWAN, măt-te-a-won', N. Y. See Beacon, N Y

MATTEI, mat-tā'ē, Tito, Italian musician and composer. b Naples, 1841; d 30 March 1914. He was educated in Naples He received the degree of professor in Saint Cecelia's Academy at Rome when he was 11 and was also elected a member of the Philharmonic Society in Florence and other cities He gave his first concert when 15 and afterward made tours of Europe, but in 1863 settled in London, where he lived for 50 years, confining his concert tours to Great Britain, and in 1870 he conducted an Italian opera at the Lyceum Theatre. He was the composer of hundreds of songs and pianoforte pieces, many of which have become widely popular, and the operas 'Maria di Gand,' 'La Prima Donna,' etc

MATTER, in physics, mechanics and chemistry, the tangible substance of which the world external to our minds is composed and which is characterized by the resistance which it opposes to muscular efforts exerted upon it. Since we can know it only through the mediation of our senses, its actual objective reality has often been questioned by philosophers and metaphysicians; and in order to avoid doubtful points of this sort it is frequently defined merely as a "physical concept," without making any hypothesis as to its objective existence (Consult Pearson, 'The Grammar of Science') In physics and chemistry we think and speak of it as having a real existence, however, just as we do in common life For scientific purposes it is highly important to be able to accurately compare the quantities of matter in two bodies; but the phrase "quantity of matter" is not com-monly used in science, the word "mass" (or inertia) being substituted for it. The term "mass" is synonymous with "quantity of matter" so long as the bodies compared are identical in composition and in physical state; but by its use we avoid the uncertainty in the meaning of the longer phrase, when it is applied to bodies of dissimilar composition. Two bodies are said to have "equal masses" under the following conditions: Let the two bodies be conceived to be initially at rest, and free from the action of any external forces whatsoever Let them then be exposed to the action of equal forces for an equal length of time. If, under these circumstances, the velocities that are produced in the two bodies are equal, the masses of the bodies are also equal, by definition But if the velocities that are produced are unequal, then the masses are also unequal, and are (by definition) proportional to these velocities; the body which is moving the faster being the one whose mass is the less It would be impossible to carry out an elaborate experiment of this kind every time we wished to compare the masses of a pair of bodies, and it fortunately happens that masses can be compared with great accuracy by merely weighing the bodies against each other in a balance. For equality of weight means that the earth's attractive force is the same upon both; and if (as we know to be the case, by experiment,) the two bodies would fall with the same speed in a

vacuum, it follows that equal forces acting upon the two bodies for equal times communicate to them equal velocities, and hence, by the defini-"mass," the mass of the two bodies are tion of equal It will be noted that mass and weight are two essentially different things, although they are very commonly confused, because they are strictly proportional to each other, according to the most accurate experiments that have yet been made Yet it is not at all impossible to imagine a state of things in which mass and weight would not be strictly proportional only by experiment, for example, that we know that the earth attracts a body with precisely the same force, whether the body is hot or cold The attraction between two permanent magnets varies with the temperature, and it may yet be found that gravitative attraction varies in the same way, though to a much smaller extent Numerous experimenters have in fact fancied that they could detect an effect of this kind, though its reality is not yet admitted. But we can hardly admit that the mass of a body is a function of the temperature; and so we see that the apparently strict proportionality between mass and weight is not at all a necessity of thought, but merely an experimental fact, which may any day be shown to be nothing but a close

approximation to the actual truth

So far as we know, matter can neither be destroyed nor created by any experimental means at our command, nor by any process now operative in nature. This great fact is often called the "law of the conservation of matter," and it appears to be rigorously true As has been pointed out above, future experiment may show that the weight of a body depends to a slight extent upon its temperature, and it may also be found that the weight of a chemical compound is not always precisely equal to the sum of the weights of its constituents; but it is believed that any irregularities of this sort that may be discovered will hold true to the weight only, and will not affect the mass; and that the weight will also return to its original value when the substance that is weighed is brought back to the same chemical and physical condi-tion again. The gravitative action of matter is one of its most singular attributes, and one which we are still far from understanding It is apparently true that every particle of matter attracts every other particle with a force which is directly proportional to the product of the masses of the two particles and inversely proportional to the square of the distance be-tween them, and independent of every other circumstance It is not certain that this law holds true, nor that the attraction exists at all, at distances comparable with the distance from the earth to the fixed stars, but it appears to hold rigorously at distances commensurate with the dimensions of the solar system. Electric and magnetic forces may be either attractive or repulsive; but gravitative action is probably always attractive, the only phenomena which would countenance the opposite view being the apparent repulsion that the sun exerts upon the tails of comets and upon the coronal streamers that are seen at the time of a total solar eclipse
Matter exists in three (or perhaps four)

physical states All ordinary bodies, for example, may be classified, roughly, either as solids or fluids; fluids being further subdivided into liquids and gases. This classification is not all

that could be desired, since there are certain bodies (such as wax) which have certain characteristics of the solids and certain others of the liquids A more complete and systematic classification is hardly practicable, however, in the present article A solid body may be defined as a body capable of resisting a considerable shearing stress. (See Elasticity). Solid bodies usually have a considerable tensile strength also. A solid does not yield continuously to a small deforming force; it resists deformation, and its resistance increases as the deformation increases A fluid, on the other hand, is a substance having almost no shearing strength, and offering very little resistance to forces that tend to change its shape A fluid yields continuously to a deforming force, and a force that will deform it at all will deform it indefinitely, so long as it is allowed to act. Considering the subdivision of fluids into gases and liquids, we may say that a gas is a fluid that presses conunuously and in every direction upon the walls of the vessel containing it and which follows them indefinitely if they retreat A gas, if left to itself, tends to expand infinitely in all direc-A liquid is a fluid which does not follow the walls of the containing vessel if they retreat and which has no tendency to expand indefi-nitely if left to itself. (For the prevalent theories regarding the constitution of matter, see Gases, Kinetic Theory of; Molecular THEORY).

When a gas is rarefied very highly by a mercury vacuum pump, it exhibits properties which are different in many respects from those manifested by gases in the ordinary state of density. The pressure in such a rarefied gas, for example, may be different in different directions; so that in this respect, at least, the rarefied medium resembles a solid rather than a gas or liquid. Mechanical and electrical properties are also observed at high exhaustions which cannot be reproduced at ordinary pressures; and for these and other reasons Crookes considered that a gas, when under only (say) the millionth or ten millionth of an atmosphere of pressure, may be fairly said to constitute a "fourth state of matter," which he considered to be as different from the gaseous state as the gaseous state is from the liquid state. At first thought this appears to be an extreme and hardly a justifiable view; but it must be remembered that Andrews showed that the distinction between a liquid and the gas or vapor obtained from it by cvaporation ceases to exist at temperatures higher than a certain critical value peculiar to each substance. (See Critical Point). This temperastance. (See Critical Point). This temperature is about 88° F. for carbon dioxide, and at temperatures progressively higher than this the isothermals of carbon dioxide approximate with increasing closeness to the hyperbolas of a perfect gas. It might be thought that a critical state exists with reference to the solid and liquid states; but this is still somewhat doubtful. It appears probable that no such state exists between a solid and its liquid, unless the solid is crystalline; and its existence has not been established even for this case.

See Molecular Theory; Liquefied and Compressed Gases; Electron Theory; Solutions; Ether; Vacuum, etc. Consult, also, Tait, 'Properties of Matter'; Kimball, 'Physical Properties of Gases'; Poynting and Thomson, 'Properties of Matter': Risteen, 'Molecules

and the Molecular Theory of Matter'; Lehmann, 'Molekularphysik.'

MATTERHORN, mat'tĕr-hôrn, Mount. See Cervin, Mont.

MATTESON, măt'ĕ-son, Tompkins Harrison, American artist: b Poughkeepsie, N. Y, 9 May 1813, d. Sherbourne, N. Y, 2 Feb. 1884. His early lessons in art were from an Indian; otherwise he was mostly self-taught until after the success of his 'Spirit of '76,' when he settled in New York and studied in the National Academy From 1851 until his death his home was Sherbourne. For a time he was a member of the New York legislature. His themes were historical or from American country life, and his best-known pictures are 'The First Sabbath of the Pilgrims,' 'Examination of a Witch,' 'Eliot Preaching to the Indians,' 'Rip Van Winkle's Return from the Mountains,' 'At the Stile' and 'Foddering Cattle.'

MATTHEW. Matthew, the apostle of Jesus Christ, is with sufficient certainty identified with Levi, the son of Alphæus, whose call by Jesus to discipleship is described in Mark and Luke in terms practically identical with a story of the call of Matthew in Matthew. It was not uncommon among the Jews for a man to have two names and sometimes both names were of Hebrew, or Aramaic origin. The derivation and consequently the meaning of the name Matthew is uncertain, though it is commonly interpreted to mean "Gift of God" The mere mention of his father's name does not identify his family to us. He is first spoken of as being in his office as a "publican," or collector of taxes, presumably near Capernaum on the great highway between Damascus and the Mediterranean. While as such officer he would be in the service of the Tetrarch Herod, and not directly in Roman employ, yet he must have shared the obloquy which attached to this office among strict Jews, and it has accordingly been reckoned a mark of his humility that we find him designated as "the publican" in the Gospel which bears his name. After his call to discipleship he made a great feast of farewell, gathering his former friends and business associates to meet his new-found Master and the disciples attending him. The name of Matthew stands in all the lists of apostles, always the seventh or eighth in order, but of his activities as an apostle we have no record No other name than his has ever been associated with the authorship of the first Gospel, and while this view has been discredited by many critics, because of the difficulty of considering the Gospel in its present form the work of an apostolic eyewitness, it is possible to conserve the historical value of this strongly confirmed tradition by holding that he was the author of the Discourse Document which constitutes such an important and characteristic element in Matthew. (See article MATTHEW, GOSPEL ACCORDING TO). There are many variant traditions as to the missionary labors of Matthew, Macedonia, Egypt, Ethiopia and Parthia having been named as places where he worked. There is no sufficient reason for accepting any of these traditions, though perhaps the last is the most probable. Some traditions assert that he died as martyr and this has been accepted in the Western Church, but according to other traditions perhaps no less reliable he died a natural death.

DAVID FOSTER ESTES, Late Professor of New Testament Interpretation, Colgate University.

MATTHEW, George Frederick, Canadian geologist: b. Saint John, New Brunswick, 1837. He received his education at the University of New Brunswick, secured a civil service post in 1853 and in 1879 was appointed chief clerk of customs. He was made surveyor of customs in 1893 He collaborated with Bailey, in 1872, in preparing a report on the geology of southern New Brunswick and in the following year prepared a report on the carboniferous system of that province. Subsequently he made several geological tours of exploration in the Maritime Provinces. He was a Fellow of the Royal Society of Canada and member of the New Brunswick Natural History Society. He published geological papers in various technical and scientific periodicals. D. 14 April 1923.

MATTHEW, Gospel According to. The Gospel with which the name of Matthew has uniformly been associated has with almost equal uniformity stood first in the gospel canon. It received this place both because it is the longest of the Gospels and because of the apostolic authority which the name of Matthew gave to it, but the place is fitting also because it relates itself more closely to the Old Testa-

ment than does any other gospel.

Contents.—As respects the events recorded, they are much the same as those given in Mark and Luke, and are arranged in substantially the same order. The book may be briefly analyzed somewhat as follows: Introductory, genealogy, birth and infancy of Jesus, ministry of John the Baptist, baptism and temptation of Jesus, i, 1-iv, 11. I Early Galilean ministry (iv. 12-xii, 50). II Later ministry in Galilee and neighborhood, and the Perean journey (xiii, 1-xx, 34). III. Entry of Jesus into Jerusalem and his teaching there mainly contravailed. and his teaching there, mainly controversial (xxi, 1-xxiii, 39). IV Eschatological discourse (xxiv, 1-xxv, 46). V. Closing scenes, anointing at Bethany, last supper, agony in Geth-semane, trial, crucifixion, death and resurrection (xxvi, 1-xxviii, 20). In addition to the story of events and many brief reports of sayings of Jesus, this Gospel is marked by a cycle of five long discourses, each followed by a uniform formula, "It came to pass when Jesus finished" These discourses are "The Sermon on the Mount's (v, 1-vi, 27); the "Address to the Apostles" (x, 5-42); the collection of "Kingdom Parables" (xui, 1-52); the "Discourse on Humilty and Forgiveness" (xvii, 1-35); and the "Apocalyptic Discourse" (xxiv, 4-xxv, 46). While it need not be doubted that Jesus spoke at length on each of the occasions with which these discourses are connected, it is commonly held, especially in view of the somewhat parallel reports in Luke, that the author has gathered sayings spoken at various times and grouped them into what may be called "bouquets" of discourse, uniting them, not on the ground that all were spoken on the same occasion, but rather according to a logical association of ideas. This Gospel is also characterized by an arrangement of material in groups of threes, fives or sevens, presumably to aid the memory. Some 40 triplets have been named, eg, the genealogy is arranged in three groups of 14 generations each, in chapters viil and ix there are three miracles of power, followed by three of restoration, there are given three prayers in Gethsemane, etc. Groupings by five and seven are not so common but occur often enough to deserve note as a striking characteristic of this book.

Purpose.—The purpose of the author plainly was to confirm Jewish Christians in their belief that Jesus of Nazareth was the Messiah long foretold by the prophets and expected by his nation. This is strikingly shown by the many references to the Old Testament which is cited no less than 40 times, often with the formal statement "that it might be fulfilled." The frequent use of the title "Son of David," as well as the genealogy which is traced back to Abraham through the royal line of David, the declaration in the Sermon on the Mount of his right to legislate parallel to the original gift of the Divine law through Moses, the assertion that the kingdom would be taken from the Jews and given to others and the grief over Jerusalem, the picture of himself as the judge at the Final Judgment, these claims in addition to the claims of Messiahship found in the other Gospels and culminating in the declaration of the Risen Christ that all authority in heaven and earth alike is his, all this abundantly proves that the object of the author was to show that Jesus of Nazareth was the promised Messiah and that all the Divine promises were to be fulfilled, not for the nation at large which had rejected him, but for

Sources.— Careful comparison of the first Gospel with the second shows that the order of events is substantially the same in both and that almost every paragraph of Mark is reproduced in Matthew, the exceptions being only seven brief paragraphs of at most less than 35 verses. As the theory that Mark is an otherwise of Mattheward and Mark is an otherwise of the seven by the seven brief paragraphs of the most less than the seven before the seve abbreviation of Matthew has proved untenable, it follows that Matthew must be in some way dependent on the material of Mark: the resemblance is too close to permit the supposition that both drew from some independent document. But while the source of Matthew must have corresponded in general very closely to the present form of our Mark, yet this contains so much of picturesque detail which is not reproduced in Matthew that it cannot reasonably be held that Mark as we now have it was the source in question. How to account for this difference is still a problem of critibe traced in Matthew a second main source, sometimes "Q." (See article Gospels). In addition, there is some material which cannot reasonably be traced to either of the two main sources, as the genealogy and the infancy narratives, but it is impossible now to trace the origin and extent of these special sources. This fact need not, however, impair our sense of their trust-worthiness. It may also be noted that it is not reasonable to hold that the author of this book was a mere copyist who kept slavishly to the exact form of any written sources which lay before him.

Authorship.— The author of this Gospel for Jewish readers must of course have been himself of Jewish descent. Nor is his use of the

Greek language inconsistent with this, since the use of Greek was so widespread that in the 1st century Palestine must have been largely bi-lingual. That he was a Palestinian Jew is manifest from the whole tone of his work tone of his work is also such as to make it doubtful whether the author of the book as it now stands was himself an associate of Jesus in his ministry While much of the material must go back to eyewitnesses, the author himself seems more remote Accordingly the difficulty in the way of accepting the early and uniform tradition that the Apostle Matthew was the responsible author is increasingly felt It is also generally recognized that the book does not have the unavoidable marks of being a translation, but shows that it must have been originally composed in Greek, while the early tradition was that Matthew composed his work in the "Hebrew language," by which of course the Aramaic was meant, which had long before replaced Hebrew in common use It will retarn the substantial value of the tradition if it is held that Matthew was the author of "Q" When the Marcan source was reworked to include the collection of discourses and other material which was due to Matthew, it would not be surprising to find his name attached to the whole work Accordingly, while the direct authorship by Matthew of the book in its present form is still very commonly held, there is a perhaps increasing tendency among critics to connect only the "Logia" document with the Apostle himself.

Date and Place of Composition.—There is little dissent at present from the view that this Gospel was composed late in the seventh decade of the 1st century, presumably 65-68 As to the place of composition there is less agreement The material is Palestinian, but many feel a certain sense of detachment as if the author was not when he wrote amid the scenes which he describes. Of course this might be true if written in some place in Palestine remote from both Capernaum and Jerusalem; some Syrian city has been suggested, and even Alexandria has been thought not too remote, especially in view of its large Jewish and Jew-

ish-Christian population

Authenticity and Value.—If the common view of Matthew's direct authorship is still to be accepted, then this Gospel as the work of an apostolic associate of Jesus must be trustworthy and valuable in the highest degree. If, on the other hand, the book is referred to an unnamed author who worked mainly on the basis of the Marcan and Logia documents, its trustworthiness and value will be impaired less than might at first be supposed. We must assume the honesty of the compiler and editor, which indeed is everywhere manifest, and according to the theory he was working on documents which embodied the common Christian tradition approved by the many disciples who had seen Jesus face to face or which even had full apostolic authority. Such were presumably the Marcan source and most probably the Matthæan Logia, while the genealogy could have been drawn from public sources, and the tone of the infancy narratives is such as conclusively to guarantee their very early date. When all these facts are taken into account, it will appear that the latest criticism really confirms the often quoted saying of Renan. "The Gospel of Matthew, all things considered, is the most important book of Christianity - the most important book that has

ever been written»

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Late Professor of New Testament Interpreta-tion, Colgate University.

MATTHEW TOWN. See INAGUA, GREAT. MATTHEWS, (James) Brander, American author: b. New Orleans, La., 21 Feb. 1852; d. 31 March 1929 He was graduated from Columbia in 1871, from Columbia Law School in 1873, admitted to the New York bar (1873), began to contribute to the magazines in 1873, later turned wholly to literature and in 1892 was appointed professor of literature in Columbia. În 1900-24 he was professor of dramatic literature. He was a founder of The Players and Authors clubs, of the Dunlap Society and the American Copyright League, and of the Columbia University Press In 1889-91 he was president of the 19th Century Club He was appointed to French Legion of Honor in 1907 Elected to American Academy of Arts in 1908 President of Modern Language Association in 1910 and of National Institute of Arts and Letters in 1913-14. He wrote several dramatic works, among them 'This Picture and That'; 'A Gold Mine' (with G H. Jessop); 'On Probation' (also with Jessop); and 'Peter Stuyvesant' (with Bronson Howard). His published volumes include from an extensive published volumes include, from an extensive list, the following: French Dramatists of the Nineteenth Century' (1881); 'In Partnership' (with H C. Bunner, 1884); 'A Secret of the Sea, and Other Stories' (1886); 'Pen and Ink' (1888); 'American Literature' (1896); 'A Sea, and Other Stories' (1886); 'Pen and Ink' (1888); 'American Literature' (1896); 'A Confident To-morrow' (1898); 'The Action and the Word' (1900); 'Parts of Speech: Essays in English' (1901); 'The Development of the Drama' (1902), 'Molière' His Life and His Works' (1910); 'Shakspere as a Playwright' (1913); 'On Acting' (1914); 'The Oxford Book of American Essays' (1914); 'These Many Years' (1917); 'Principles of Playmaking' (1919); 'Essays on English' (1921); 'Playwrights and Playmaking' (1923). He was perhaps best known for his critical papers.

MATTHEWS, Edmund Orville, American naval officer: b Baltimore, 24 Oct. 1836; d. 30 Jan 1911. He was graduated from the United States Naval Academy in 1855 and served in the navy before the outbreak of the Civil War, in which he served with distinction. In 1869-73 he was in command of the torpedo boat corps at Goat Island, Newport Harbor, and he com-manded the *Brooklyn* in the Asiatic squadron in 1885-87; he was a member of the Board of Inspection and Survey in 1891-94 and in 1897 was raised to the rank of rear-admiral. He was appointed president of the Examining Board in 1898 and served until he was retired in that year

MATTHEWS, Franklin, American journalist: b. Saint Joseph, Mich., 14 May 1858; d. 26 Nov. 1917. Graduated from Cornell University 1883, he was reporter and editor on the Philadelphia Press, 1886-90, reporter, editor, correspondent of the New York Sun, 1890-1912. He was assistant Sunday editor and night city editor of the New York Times, 1912-15. He was associate professor of journalism, Columbia University, 1914 He was a trustee of Cornell University, 1913-18, and also president of the Cornellian Council, 1915. He published 'Our Navy in Time of War' (1899); 'The Newborn Cuba' (1899); 'With the Battle Fleet' (1909); 'Back to Hampton Roads' (1909)

MATTHEWS, John Hobson, English archivist: b Croydon, near London, 1858; d Ealing, 23 Jan 1914. He was educated at the Proprietary School of Blackheath and at The Leys, Cambridge In 1877 he entered the Roman Catholic Church and two years later was made a solicitor From 1894 to 1903 he was employed as archivist to the corporation of Cardiff, Wales, and was also archivist to the county and urban councils of Monmouthshire His various avocations included those of expert archivist, record searcher, genealogist, journalist and legal antiquary. In 1895 he discovered the text of the grant of Cardiff lands to Sir William Herbert, in 1550, the document being almost illegible In the following year he brought to light the text of a charter to the borough of Newport. In 1903 and 1911 he was called as expert before the Royal Historical Manuscripts Commission. He published 'History of St. Ives, Cornwall'; 'History of the Hundred of Wormelow'; 'The Vaughans of Courtfield'; 'The Old Faith and the New'; 'Life and Memorials of St. Teilo'; 'The Mass and its Folklore'; 'Continuity Reconsidered' He continued Duncumb's 'Herefordshire,' edited 'Cardiff Records' (1898–1905) and contributed to 'The Catholic Encyclopedia,' the Tablet, Athenæum, etc.

MATTHEWS, Marmaduke Matthews, Canadian artist b Warwickshire, England, 1839; d. 1913 He received his education in Oxford and London; removed to Toronto in 1860 and resided in New York from 1864 to 1869 In the latter year he returned to Toronto, was one of the founders of the Ontario Society of Artists, of which he was president in 1894 He excelled in woodland studies. His bestknown works are 'The Canadian Wonderland' and 'The Conquered Portal'

MATTHEWS, Paul, American Protestant clergyman: b. Glendale, Ohio, 25 Dec 1866 In 1887 he was graduated at Princeton University and three years later at the General Theological Seminary, New York. In 1891 he was ordained to the ministry of the Protestant Episcopal Church; served as assistant at the church of the Advent, Walnut Hills, Cincinnati, 1890-91; entered the Associate Mission, Omaha, and had charge of Saint Paul's and Saint John's churches in 1891-95 From 1896 to 1904 Dr. Matthews was rector of Saint Luke's, Cincinnati, and from 1904 to 1913 was dean of Saint Paul's Cathedral of the same city In 1913-15 he was dean of the cathedral at Faribault, Minn, and professor at Seabury Divinity School. On 25 Jan 1915 he was consecrated bishop of New Jersey.

MATTHEWS, Stanley, American jurist-b Cincinnati, Ohio, 21 July 1824; d Washington, D C, 22 March 1889 He was graduated from Kenyon College in 1840, studied law and was admitted to the bar in 1842, when he established a practice in Maury County, Tennbut returned to Cincinnati in 1844 and engaged in practice there. He was editor of the Cincinnati Herald, an anti-slavery journal, in 1846-49, and held various political offices, and in 1855-56 was a State senator. In 1858 he was appointed United States district attorney for the southern district of Ohio, but at the outbreak of the Civil War in 1861 entered the volunteer service and was commissioned licutenant-colonel and was a colonel when in 1863 he resigned to accept the seat of judge of the Superior Court of Cincinnati. He was elected United States senator in 1877 after having acted as counsel before the Electoral Commission, and in 1881 he was appointed a justice of the Supreme Court of the United States.

MATTHEWS, Washington, American physician and ethnologist b Killiney, Dublin County, Ireland, 1843; d 1905 In 1864 he was graduated at the medical school of the University of Iowa He was commissioned assistant surgeon in the United States army, from which he retired as surgeon in 1895. He made several anthropological studies of the Indians of North America His published works include 'Dictionary of the Language of the Hidatsa' (1873); 'Navaho Silversmiths' (1883); 'Navaho Weavers' (1884); 'The Mountain Chant, a Navaho Ceremony' (1887), 'Navaho Legends' (1897); 'The Mystic Chant, a Navaho Ceremony' (1902); 'Navaho Myths, Prayers and Songs' (1907).

MATTHIAS, ma-thī'as, a disciple of Jesus, probably one of the 70, who was chosen by lot to take Judas Iscariot's place among the 12. Little is known of him Even early legend confused him with Matthew, and an apocryphal gospel was attributed to him. In the Roman Catholic Church 24 February, in the Greek 9 August, is sacred to him. The 'Acts of Andrew and Matthias' make him a missionary in Africa Consult Eusebiús, 'Ecclesiastical History' (Vol I, 12; II, 1)

MATTHIAS (Ger mat-tē'ās), emperor of Germany b Vienna, 24 Feb. 1557; d 20 March 1619. He was a younger son of Maximilian II. He was made governor of Austria in 1593 and two years later became heir to the imperial throne He fought in the war against the Turks and in 1606 was made head of the House of Hapsburg. He became king of Bohemia in 1611 and had annexed Hungary and Moravia before the death of Rudolf II. In 1612-19 he was emperor of the Holy Roman Empire, having been elected on the death of his brother, Rudolf II (qv.). His reign was an unsuccessful one owing to the religious dissensions among the constituent parts of his empire. He attempted in vain to suppress by decree the Catholic League and Protestant Union Consult Gindely, A, 'Rudolf II und seine Zeit' (Prague 1868) and Heling, J, 'Die Wahl des römischen Königs Matthias' (Belgrade 1892)

MATTHIAS I, Hunyadi ("Corvinus"). kŏr-vē'noos, The Great, king of Hungary: b. Klausenburg, Transylvania, 23 Feb. 1440; d. MATTING 445

Vienna, 4 April 1490. The second son of John Hunyady, he was imprisoned in Bohemia by his father's enemies, who strongly but unsuccessfully opposed his candidacy for the crown of Hungary in 1458. Another party of opposition attempted to make the Emperor Frederick III king of Hungary; but Matthias brought them to terms and in 1463 made peace with Frederick. By the Peace of Olmutz, 22 July 1479, he gained Silesia, Moravia and Lausitz, and the succession to the crown of Bohemia. In his wars with the Turks he was equally successful and a part of Bosnia was ceded to him by the Porte War broke out again with the Austrian emperor; Matthias invaded his territory and captured and held Vienna His court was a centre of scholarly men and his library, called the Corvina, a famous collection The internal administration of Hungary was greatly improved under Matthias. Consult Fraknót, Vilmós, (King Matthias Hunyadi) (Budapest 1890; German trans, Freiburg 1891) and Galeotti, Marzio, 'De egregie sapienter et jocose dictis ac factis Matthiæ regis' (Vienna 1746).

MATTING. While this term is usually employed to designate floor coverings made from reeds and fibrous grasses, it is a generic term which includes not only the commercial mattings for house floors, which are made in Eastern countries, but a much wider range of articles useful in the domestic economy and in other employments, such as screens and tatties, sleeping mats (used in India and the East), the matting employed by nurserymen for protecting hotbeds and cold frames, and even some forms of thatch For the most part mattings are hand-woven, in the finer varieties the warp being cotton or other yarns and the filling the culms of various sedges, reeds and grasses, an example being the familiar Japanese mattings of the house-furnishing stores. In the Russian bast mattings for nurserymen's use, bast of the linden tree is employed for both warp and filling, very coarsely woven or platted The roots of the Khus-Khus (Andropogon squarrosus), a perennial grass of India, are woven into fragrant screens for open windows and also made into awnings The Taika rush mats of Formosa are famous as sleeping mats, and the best grades are said to be as fine and soft as cloth, resembling the best Panama hat weaving. Consul Davidson states that a mat of the highest grade, measuring 5 x 6 feet, requires the labor of a girl weaver 120 days, and such mats have sold for 60 to 70 yen (or about \$40). The rush is an unidentified species, but sleeping mats are made from several species of Cyperus and Scirpus found in Asia. Africa and other countries.

The commercial mattings used for house decorations are for the most part of Chinese and Japanese marufacture. In Japan two species are employed, Juncus effusus, the Bingoi mat rush, which is always manufactured mto the costly math used by the higher classes (and known as Tatamnomote) and Cyperus unitons, which is employed for the cheaper grades. The largest importer of these mats is the United States, England, Austria and Germany, following in the order named. The qualities of the Bingoi are named as follows: Kinkwanyen, manufactured at Okayama; first quality Aya-

mushiro, second quality Aya-mushiro, Damask Aya-mushiro, common Aya-mushiro, manufactured at Bittiro. First quality Somewake-mushiro, common Somewake-mushiro, Damask Hana-mushiro, common Hana-mushiro, manufactured at Bingo; ordinary Hana-mushiro (best quality), manufactured at Chikugo. Cyperus unitans produces the Shichito-i mats which are chiefly manufactured in the Oita prefecture The plant is cultivated both upon upland and irrigated lands. The varieties of mats from this species are known by names as follows: Kikaiori Hana-mushiro, Damask Hana-mushiro, common Hana-mushiro (two forms). Seidaka Hana-mushiro, manufactured at Bungo. Mattings made from the two species above have been exported in a single year to the value of 650,000 yen, or over \$400,000 The Chinese and Korean mat rush is Cype-

The Chinese and Korean mat rush is Cyperus tegetiformis, this species also being used for the manufacture of cuffs and sandals. The India commercial mattings are made chiefly from Cyperus corymbosus and tegetum; the latter being known as the Calcutta mat rush, while the former is used for the Tinnerelly mats which are the finest made in India. They are also made at Palghat, but these are not so fine. In the manufacture of the India mattings the culms are split into two or three parts and then woven into mats upon a warp of threads previously stretched across the floor of a room. The operator passes the culms with the hand alternately over and under the successive threads of the warp and presses

them home

It would be difficult to enumerate all of the mattings made in different countries, though mention should be made of the fine and highly prized Niihau mats of Hawaii, produced from Cyperus levigatus. Matting is made in Spain and Morocco from Juncus maritimus, and in Italy from Juncus acutus. Two species of sword rush, Lepidosperma gladiatum and L. flexuosum, are used by the natives of Australia not only for mats, but for baskets and other articles, and Lepironica mucronata, found in Asia, Africa and Polynesia, supplies the fibre for the mats with which Chinese boatmen cover their cargoes.

In the United States, a handsome and utilitarian form of floor matting is largely manufactured from Slough grass, Carex filiforms. In normal years the imports of mattings to the United States reach a total of \$3,250,000.

United States reach a total of \$3,250,000.

The University of California conducted many experiments with several species of matting rushes, chiefly Juncus effusus, and J. Robustus, from which a fine sample of matting had been manufactured at a factory in Maine. There are now about a dozen factories in the United States manufacturing mats and matting from grass and coir.

For matting fibres consult 'Dictionary Economic Products of India,' 'Descriptive Catalogue of Useful Fiber Plants of the World,' and 'The Island of Formosa,' by Jas. W Davidson. Consult also 'History and Manufacture of Floor Coverings' (New York 1898) The leaves of many species of palm, in different parts of the world, are used for native mats and mattings, though few of these eyer reach commercial importance. See Palms.

CHARLES RICHARDS DODGE.

MATTING FIBRES. See FIBRE

MATTIPI, or FROG SNAKE, serpent (Xenodon severus) of northeastern South America While a poisonous variety, it is slow to bite. Its posterior teeth serve as fangs, but it has no venom sacks. The bite causes temporary swelling and soreness, but is seldom fatal.

MATTISON, Hiram, American Methodist Episcopal clergyman: b. Norway, Herkimer County, N. Y, 1811; d. 1868 After holding pastorates at Watertown and Rome, N Y, he became pastor of the John Street Church, New York, in 1852 Subsequently he was made pastor of Trinity Methodist Episcopal Church in the same city. In the General Conference of 1860 Mattison tried to have action taken against all slave-holding members in the Church, and piqued at his failure he withdrew from the Church in 1861 and was made pastor of Saint John's Independent Methodist Church. Four years later he returned to his old denomination and was appointed to the pastorate of Trinity Methodist Episcopal Church, Jersey City. In 1868 Mr. Mattison was district secretary of the American and Foreign Christian Union. His published works include 'Tracts for the Times' (1843); an edition of Burrit's 'Geography of the Heavens' (1850); 'Spirit-Rapping Unveiled' (1854); 'Sacred Melodies' (1859); 'Impending Crisis' (1859); 'Immortality of the Soul' (1866); 'Resurrection of the Body' (1866); 'Popular Amusements' (1867) (Consult Vansant, 'Life of Hiram Mattison' (New York 1870).

MATTO GROSSO, ma'tō grō'sō, Brazil, a western central state bordering on Bolivia and l'araguay. It has an area of 570,138 square miles and according to the 1940 census had a population of 427,629, this being more than four times that of the year 1900. The coastal cities attract most immigrants. It appears, therefore, that in this vast political division of Brazil there is an average of only one person to each two and one-third square miles, the estimates being based upon those given in the Pan-American Union handbook 'Brazil.' The only Brazilian state exceeding this in size is Amazonas (q.v.). The best recent descriptions of a portion of the interior from Paraguay up to the Amazon River are in the following books: Roosevelt, T., 'Through the Brazilian Wilderness' (New York 1914); Zahn, J. A. (H. J. Mozans), 'Through South America's Southland' (New York and London 1916); Funke, A., 'Brasilien in 20sten Jahrhundert' (1927). The ex-President wrote: "It is certain that this inland region of Brazil, including the state of Matto Grosso, which we were traversing, is a healthy region, excelently adapted to settlement; railroads will speedily penetrate it, and then it will witness an astonishing development."

MATTOON, ma-toon', Ill., city in Coles County, alt. 725 feet, on the Illinois Central and the Cleveland, Cincinnati, Chicago and St. Louis railroads, and on state and federal highways; 85m. by rail SE. of Springfield. Situated in an agricultural region, Mattoon is an industrial city, making furniture, shoes, Diesel engines, and brooms. Broom corn is a major crop in the surrounding district. The two rail-

roads serving the city have machine shops and repair shops there. The city has a public library Mattoon was settled and incorporated in 1855, in connection with construction of the Illinois Central through this region, and was named for William Mattoon of that railroad, who played an important part in organization of the town. It was here, in 1861, that Ulysses S. Grant mustered the Twenty-first Illinois Volunteers into service, with himself as colonel, appointed by Governor Yates. The city has commission government The water supply is municipally owned. Pop. (1940) 15,827.

MATURIN, Charles Robert, Irish dramatist and novelist b Dublin, 1782, d 30 Oct. 1824 He received his education at Trinity College, Dublin, entered the ministry of the Church of Ireland and served successively as curate at Loughrea, County Galway, and at Saint Peter's, Dublin. He wrote the novels 'The Fatal Revenge; or, the Family of Montorio' (1807); 'The Wild Irish Boy' (1808); 'The Milesian Chief' (1812), under the pseudonym of "Dennis Jasper Murphy." The novels were ridiculed by the critics, but attracted favorable attention from Sir Walter Scott, who introduced Maturin to Lord Byron. These powerful friends secured the production of Maturin's tragedy 'Bertram' at Drury Lane in 1816, with Kean in the leading rôle. It ran for 22 nights, and a French version was produced soon afterward at the Théâtre Favart, Paris. His other tragedies 'Manuel' (1817) and 'Fredolfo' (1819) failed totally Among his other works were the novels 'Women' (1818); 'Melmoth the Wanderer' (1820), and 'The Albigenses' (1824). 'Melmoth' is his greatest work and was most successful in its day. Balzac wrote a sequel to it entitled 'Melmoth Reconciled to the Church' (1835) Consult 'Melmoth,' edited with memoir of the author and bibliography (London 1892).

MATURIN, mä-too-rēn', Venezuela, capital of the state of Monagas, formerly the capital of the state of Maturin. It is on the Guarapiche branch of the Orinoco Delta, 25 miles by rail above its port, Colorado, and 40 miles from the sea. A considerable trade with the West Indies, principally in cattle and hides, is carried on. In the neighborhood are extensive plantations of cacao, sugar cane, fruits and cereals. Its industrial establishments turn out cigars, hammocks, boots, shoes and soaps. Pop. 15,405.

MATZOON, a milk food used in Armenia; prepared by exposing milk in open vessels to a heat of 90° F, and when coagulation takes place the curd is broken up by a churning process and a little salt is added See Kumiss

MATZOTH, the Hebrew name for a kind of unleavened bread or biscuit eaten by the Jews during the feast of the Passover.

MAUBEUGE, mo'bezh, France, fortress and manufacturing town in the department du Nord, occupying both banks of the Sambre, 140 miles by rail northeast from Paris, within two miles of the Belgian frontier. The origin of Maubeuge was in a double monastery for monks and nuns founded in the 7th century. Destroyed successively by the Normans, by Louis XI, by Francis I and by Henry II, it finally fell to France by the Treaty of Nimeguen in 1678, and was fortified by Vauban. Pre-

vious to outbreak of World War I in 1914 it was defended by nine forts. The principal industry is the manufacture of iron and steel products. The town was occupied by the Germans in 1914 and again in 1940. Pop (1946) 20,859.

MAUCH CHUNK, môk chungk, Pa., borough and Carbon County seat, situated on the Lehigh River at an elevation of 916 feet, 29 miles northwest of Allentown; it is served by the Central of New Jersey and the Lehigh railroads. The first settlement here, on the edge of the Pennsylvania anthracite coal region, was begun in 1815 by the Lehigh Coal and Navigation Company. Both the Lehigh Canal and the Lehigh Valley Railroad had their start here A gravity railroad, constructed in 1827 to haul coal from the mines, was discontinued in 1870, and thereafter was a popular scenic railway until the 1930's Mauch Chunk, the Indian name for Bear Mountain, was the home of Asa Packer (q v), builder of the Lehigh Valley Railroad and founder of Lehigh University. Borough incorporation was effected in 1846 Pop (1930) 3,206; (1940) 3,009.

MAUD, a poem by Alfred Tennyson (q.v.), published in 1855. Tennyson called it a "monodrama," a drama told in a series of lyric solulo-quies His explanation of its unique form is this. "The peculiarity of this poem is that different phases of passion in one person take the place of different characters" To tell the story of Maud is to follow these phases of passion. The beginning shows the hero cut off from life by his heritage of hate and wrong, crying for war to kill the greed and cruelty of peace. With war to kill the greed and cruelty of peace. With the coming of Maud, the child of his enemies, begins his new life of love that embraces mankind. His joy is shattered at its climax; a hopeless exile, he seeks only escape from the phantoms of the past. From this death in life, he is saved by the outbreak of war "in defence of the right" The ending, written to the sound of cannon booming from British battleships before the Crimean War, is a paean of battle. It was this militant strain in Maud that shocked Tennyson's admirers and still provokes criticism Yet read, not as a defense of any one war, but as an indictment of the materialistic peace that is war and that causes war, the poem shows something of that larger vision that is prophetic

As a monodrama, Mand fails to achieve dramatic unity. Many of the separate lyrics are genuine bits of inner action, of soul drama, set forth with keen psychological analysis, with skill-ful variation of meter to express fluctuation of But sequence of action, the law of feeling. drama, is sacrificed to singleness of mood, the essence of the lyric In Maud, as in The Princess, Tennyson's attempt to fuse the lyric and the dramatic moods fails. To think of Maud is to think first of those songs that have become part of the vocabulary of passion and of longing. Consult Tennyson, H., Alfred, Lord Tennyson: a Memoir, 2 vols, (London, 1897); Grierson, H., Cambridge History of English Literature, vol. 8, chap. 2 (Cambridge 1916-31).

FRANCES W. CUTLER

MAUD MULLER, a poem by John Greenleaf Whittier, first published in the National Era, December 1854. It is a ballad reciting a romantic passage in the lives of a susceptible judge and a country girl.

MAUDE, Sir Frederick Stanley, British army officer: b Gibraltar, June 24, 1864, d Baghdad, Iraq, Nov. 18, 1917 Entering the army at the age of 20, he saw his first active service in the Egyptian campaign of 1885; during 1900-1901, in the South African War, he fought in several battles as a staff officer of the Guards Brigade After three years as military secretary to the governor general of Canada he served at the War Office in connection with organization of the newly-formed territorial force. With outbreak of World War I in 1914 he went to France on the staff of the 5th Division, and shortly was given command of the 14th Brigade He returned wounded to England, and in 1915 he was sent to the Dardanelles to assume command of the 13th Division, in Gallipoli he shared in the withdrawal from both Suvla and Helles. From Egypt, whither he had gone with his division, he was transferred to Mesopotamia, and there, after failure of the attempt to relieve Kut al Imara in August 1916, he became British commander in chief. Reorganizing his forces, he began an advance in December which drove the Turks from Kut and carried him on to Baghdad, where he concluded his successful campaign in March 1917. After a pause for preparation came another forward move, marked by the last victory of his lifetime at Tekrit Again in Baghdad, Maude was struck down suddenly by cholera, which proved fatal.

MAUDSLEY, môdz'li, Henry, English alıen-1st b near Settle, Yorkshire, Feb. 5, 1835, d. Bushey Heath, Jan. 23 or 24, 1918 He gradu-Bushey Heath, Jan. 23 or 24, 1918 He graduated in medicine at the University of London in 1857, and thereafter specialized in mental diseases. From 1869 to 1879 he was professor of medical jurisprudence at University College, London In 1913 he provided £30,000 for the erection m London of the Maudsley Hospital for the Insane He edited The Journal of Mental Science from 1862 till 1878, and his numerous works included Body and Mind (1870); Responsibility in Mental Disease (1872); The Physiology of Mind (1876); The Pathology of Mind (1879); Life in Mind and Conduct (1902); and Organic to Human (1916).

MAUGHAM, môm, William Somerset, British author b. Paris, France, Jan. 25, 1874. He was the son of Richard Ormond Maugham. the solicitor to the British Embassy in France, and was the youngest of six children. Orphaned at the age of 10, he went to England to live with an uncle who was vicar of Whitstable He attended King's School at Canterbury for three years, and studied for a short time at Hyères, in south France. He spent the year 1891 in Heidelberg, Germany, where he frequently attended lectures at the university. In 1892 he entered the medical school of St. Thomas's Hospital in London, and after completing his studies, he became He discontinued the practice of a physician medicine after one year in order to devote full time to writing. In 1915 he married Syrie Barnardo, an interior decorator; they had one daughter and were divorced in 1927.

His first book, Liza of Lambeth (1897), was a story which resulted from his experiences as a doctor in Lambeth, one of the poorer districts of London A Man of Honour, his first play, was produced in 1903, although Lady Frederick in 1907, brought his earliest success; by 1908, four

of his plays were running simultaneously. Lady trederick, Jack Strice, Mrs. Pot, and The Explorer. After the publication of Of Human Bondage (qv) in 1915, which is usually considered his outstanding achievement, he wrote a steady stream of plays, short stories, and novels. His plays, most of them drawing room comedies, were performed in Europe and the United States Among them, The Circle (1921), Our Betters (1923), and The Constant Wife (1927) were outstanding. His last play, Sheppey, written and produced in London in 1933, was not especially successful.

Several of his novels and shorter pieces are reprinted almost annually. The Moon and Surpence (1919), the story of an artist, was based on the life of Paul Gauguin Miss Thompson, included in a collection of short stories, The Trembling of a Leaf (1921), was made into a a play by John Colton and Clemence Randolph under the title Rain in 1922. Ashenden, or The British Agent (1928) was drawn from the author's experiences as an intelligence agent in Switzerland during World War I Cakes and Ale, or The Skeleton in the Cupboard (1930) is a satirical story of two men of letters, who are often said to be Thomas Hardy and Hugh Walpole In 1938 Maugham published an account of his literary experiences, The Summing Up which has become a useful guidebook for persons interested in writing The Rasor's Edge (1944), the story of a young American's spiritual quest, brought his most immediate success, and was made into a motion picture in 1946. Among his more recent books are The Mixture as Before (1940), Up at the Villa (1941), Then and Now (1946), Creatures of Circumstance (1947), and Catalina (1948).

MAUI, ma'oō-ē, one of the Hawaiian Islands, situated 26 miles northwest of Hawaii; it comprises two mountainous passes joined by an isthmus The east peninsula contains Halcakala crater, 10,025 feet high, last active about 1750 There are large sugarcane and pineapple plantations. Wailuku, near the northwest coast, is the largest town and the seat of Maui County, it has supplanted Lahaina, on the southwest coast, where white men first established themselves in the island The county of Maui comprises Maui, Lanai, and Kahoolawe Pop. (1940) county 55,534.

MAULE, mou'là, Chile, a maritime province bounded north by the province of Talcá, and south by the province of Nuble The area is 2,172 square miles. Most of the surface is occupied by the forested coast range, averaging nearly 3,000 feet in height Agriculture, stockraising, and lumbering are the principal industries The province takes its name from the river Maule (q.v.). Linares (q.v.) the provincial capital, is on the main line of the state railroad; branch lines connect it with Cauquenes (pop 11,198), the former capital, and with Constitución (pop. 7,049), the chief port. Pop. (1940) 70,497.

MAULE, a river of Chile, rising in the Andes and after a westerly course of 150 miles (52 miles navigable for small vessels) entering the Pacific Ocean immediately north of Constitución; it gives its name to the province of Maule (4.v.). The Maule River is believed to have been the southern boundary of the empire of the Incas.

MAUMEE, Ohio, village in Lucas County; altitude 648 feet, on the Maumee River, 8 miles southwest of Toledo, on Nickel Plate and Wabash railroads It makes brooms, cement blocks, and butter coloring. Pop (1930) 4,588, (1940) 4.683.

MAUMEE, mô-mē', a river formed by the junction of Saint Marys and Saint Joseph rivers at Fort Wayne, Ind It flows northeast across the northwest corner of the state of Ohio, and enters Lake Erie through Maumee Bay Its affluents are the Auglaize and the Tiffin Its basin is 6,700 square miles in extent The river is 150 miles long and navigable 12 miles from its mouth to the Maumee Rapids

MAUNA KEA, mou'na kā'a, Hawaii, a semiactive volcano, highest peak in the Hawanan Islands, 13,784 feet in altitude Snow covers its upper slopes for the greater part of the year, and its sides are wooded Coffee is cultivated on the lower slopes.

MAUNA LOA, 16'a, Hawan, active volcano in the central southern portion of the island, 13,680 feet in altitude, the crater is nearly five miles in circumference, and on the inner side vertical precipices tower 500-600 feet. On the eastern slope of Mauna Loa is the still larger crater of Kilauea (q v), about nine miles in circumference but apparently having no communication with the former since their periods of activity are independent of each other. Mauna Loa's greatest activity was in 1881, it erupted on April 26, 1942, and again on Jan. 6, 1949. A sharp earthquake, accompanying its last eruption, rocked nearby Hawaii National Park Volcano House, but no damage was reported.

THURSDAY, môn'dĭ, the MAUNDY Thursday in Holy Week, the annual memorial of the Last Supper at which Christ washed the feet of his disciples The ceremony of washing the feet of the poor on that day was originally kept by noblemen and prelates, as well as by the pope and Roman Catholic sovereigns In Britain the ceremony was performed by the sovereign until the reign of William III, when it was transferred to the lord high almoner, it was discontinued in 1754 The maundy usage is now confined in Britam to gifts of money at Westminster Abbey to as many old men and women as there are years in the sovereign's age, one penny for each year, together with money in lieu of the clothes formerly given, the maundy pennies, first coined under Charles II, are silver and unmilled, and are legal tender. The yeomen of the guard carry the doles, which are distributed by the lord high almoner. Maundy Thursday is sometimes called Sheer or Chare Thursday.

MAUNOURY, mō-nōō-rē', Michel Joseph, French military officer: b. Maintenon, Eure-et-Loire, Dec. 11, 1847, d. en route from Paris to Orleans, March 28, 1923. He became an artillery officer in 1869, and in the Franco-Prussian War of 1870–1871 he was wounded at Champigny In 1905 he attained the rank of general of division and had charge of the artillery of the Paris forts General Maunoury was commandant of the École Supérieure de Guerre in 1907, the following year of the 15th Army Corps with headquarters at Marseilles, and in 1909 of the 20th corps at Nancy.

He was made military governor of Paris in 1910 and a member of the Superior Council of War In the War of 1914-18 Maunoury was placed in charge of the army of manœuver and was rushed north in an effort to turn the flank of Von Kluck's army then driving toward Paris. When the latter discovered Maunoury on his right the drive was stopped and in the battle of the Marne the invader was driven back. Subsequently after the beginning of trench warfare Maunoury held a command at Soissons. He was severely wounded in March 1915 and in the same year received at the hands of the President of the Republic the médaille militaire, the highest military honor in the gift of France. He was also an officer of the Legion of Honor. In November 1915 Maunoury succeeded Gallieni as military governor of Paris. Consult Blanchon, G, 'Le général Maunoury' (Paris 1916). See War, European.

MAUPASSANT, Henri René Albert Guy de, ŏn-rē re-nā al-bar gē de mō-pa-san, French novelist: b Chateau Miromesnil, Seine-Inferieure, France, 5 Aug 1850, d. Paris, 6 July 1893 He began his career as a clerk in the Navy Department in Paris and also served for a time in the French army during the Franco-Prussian War The novelist Flaubert, a friend of his mother's, was his godfather, and the youth took him as his model in the art of composition After years of practice, during which he wrote and destroyed a great number of manuscripts, he allowed a short story, 'Boule de Suif,' to appear in 1880, a work which displayed the greatest finish and at the same time allied him to the naturalistic school of fiction. In the same year he published a book of verse, 'Des and a drama, 'Histoire du vieux Temps' After this he continued to cultivate the short story and was very soon recognized as one of the greatest writers of short stories the 19th century had seen. In spite of the perfection of art displayed in their construction neither his brief tales nor his novels form pleasant reading. They compel admiration, but they are dominated by pessimism and in his later work the traces of an unbalanced mind may be plainly seen. In 1890 De Maupassant's mental malady occasioned the cessation of literary occupation, two years later he became wholly insane and he, died the next year in an asylum. His collecthe hext year in an asynting. His confections of short stories include 'La Maison Tellier' (1881); 'Mile Fifi' (1883); 'Les Sœurs Rondoli' (1884); 'Yvette' (1884); 'Contes du Jour et de la Nuit' (1885); 'Contes et Nouvelles' (1885); 'La Horla' (1887); 'La petite Roque' (1888); 'La Main gauche' (1889); 'Le Père Milon'; 'L'inutile Beauté' (1890), etc. The finest of his sur povels is 'Pierre et Jean'. Père Milon'; 'L'inutile Beauté' (1890), etc. The finest of his six novels is 'Pierre et Jean' (1888); the others are 'Une Vie' (1883; 'Bel Ami' (1885); 'Mont Oriol' (1887); 'Fort comme la Mort' (1889); 'Notre Cœur' (1890). He also published several collections of travel sketches, such as 'Au Soleil' (1884); 'Sur l'Eau' (1888); 'La Vie errante' (1890) A collection of 13 of his short stories published in English with the title, 'The Odd Number,' represents him at his best, both in point of art and as regards the stories themselves. The absence of a moral sense is less apparent here than elsewhere and there is less of gloom and animalism perceptible Consult Œuvres complètes de Guy de Maupassant? (29 vols., Paris

1908-10); 'Works of Guy de Maupassant' (9 vols, New York 1910); Brunetière, Ferdinand, 'Le roman naturaliste' (Paris 1883); Doumic, René, 'Ecrivains d'aujourd'hui' (ib. 1894); Bashkirtseff, Marie, 'Further Memoirs' (London 1901), Symons, Arthur, 'Studies in Prose and Verse' (New York 1904); Mahn, P, 'Guy de Maupassant, sein Leben und seine Werke' (Berlin 1908); Matthews, Brander, 'Inquiries and Opinions' (New York 1907)

MAUPERTUIS, Pierre Louis Moreau de, pē-ār loo-ē mō-rō de mō-pĕr-tu-ē, French mathematician and philosopher: b. Saint Malo, France, 28 Sept. 1698; d Basel, Switzerland, 27 July 1759 He was educated at the College of La Marche, Paris; entered the army in 1718 and after five years' service resigned in order to become instructor in mathematics in the Academy of Sciences He went to England in 1728, where he was made a member of the Royal Society and became a pupil of Newton. In 1736 he conducted a scientific expedition to Lapland for the purpose of measuring an arc of the meridian, the result of which was confirmation of Newton's theory of the flattening of the globe at the poles. In 1743 he was elected to the French Academy, in 1744 was summoned to Prussia by Frederick the Great and in 1746 was declared president of the Academy of Sciences at Berlin A dispute with the philosopher, König, regarding the discovery of the infinitesimal calculus shortened his days. Among his works are 'Sur la figure de la terre' (1738); 'Discours sur la figure des astres' (1742); 'Lettre sur la comète de 1742' (1742); 'Astronomie nautique' (1745; 1756); 'Essai de cosmologie' (1750); Maupertiana ou divers ecrits' (1753). Consult De la Baumelle, 'Vie de Maupertus' (Paris 1836); Damiron, J. P, 'Memoires sur Maupertius' (ib 1858); id, 'Mémoires pour servir à l'histoire de la philosophe du XVIIIe siècle' (Vol. III, ib. 1864).

MAUREL, mō-rěl, Victor, French singer: b. Marseilles, 1848; d. New York City, 22 Oct 1923. He was educated at the Paris Conservatoire and made his début in Paris in 1869. His first appearance in Royal Italian Grand Opera was in 1873 and he achieved a signal success. He created Iago in Verdu's 'Otello,' Falstaff in the opera of that name, and appeared in many operatic rôles in Europe and United States, being generally recognized as the leading acting baritone actor on the Italian stage. He published 'L'Art du chant'; 'Le chant renové par la science'; 'Dix ans de carrière,' etc.

MAUREPAS, Jean Frédéric, zhon fra-darek mo-re-pa, Phélypeaux, Comte de, French statesman b Versailles, 9 July 1701; d. there, 21 Nov. 1781. At 14 he succeeded to the office of Minister of State held by his father. In 1725 he became administrator of the navy, in which post he used fhe best knowledge then available to bring the navy to a high standard of perfection. He became Minister of State under Louis XV in 1738, but in 1749 was banished the court for an attack on Mme Pompadour. In 1774 he was made Prime Minister by Louis XVI and became his principal adviser. The chief events of his administration were the restoration of the Parliament of Paris (12 Nov. 1774), and the alliance with and assistance of the American colonies in their struggle against Great Britain. He gathered

to the service of the state such men as Lamoig-non-Malesherbes, Vergennes and Turgot. He intrigued against the latter and replaced him as Minister of Finance by Necker in 1776. Five years later Necker experienced the same fate. Consult Guyot, 'Eloge historique de M de Maurepas' (1782); the apocryphal 'Mémoirs' edited by J L. C Soulavie (4 vols, Paris 1792) and 'Lettres de M de Maurepas' (Paris 1896).

MAURICE, mâ'ris (John), Frederic Denison, English Anglican theologian and author, one of the leaders of the Broad Church movement b Normanston, Suffolk, 29 Aug 1805; d. Cambridge, 1 April 1872. He was son of a Unitarian clergyman; was educated at Trinity Hall, Cambridge; settled in London, where he was editor of the Athenæum for several years; and having decided to take holy orders entered Exeter College, Oxford. In 1834 he became curate of Bubbenhall, and two years later chaplain to Guy's Hospital. He became professor of history in King's College, London, in 1840, and of divinity as well in 1846, but was deprived to the beauty of the history in 1852 heaving of the liberal of both chairs in 1853 because of the liberal tenor of his 'Theological Essays.' Up to 1860 he was chaplain of Lincoln's Inn, and from ne was chaplain of Lincoln's Inn, and from 1860 to 1869 incumbent of Saint Peter's, Vere street, London. In 1866 he was elected pro-fessor of moral philosophy at Cambridge Dur-ing his life in London Maurice founded the Working Men's College and Queen's College (for women), took a prominent part in various practical philanthropies and was a leader of the Christian Socialists. He was a man of wonderfully sweet and beautiful character; a fervent preacher, who made much of the fatherhood of God; and a social reformer, whose lack of success was due to the fact that he was beof success was due to the fact that he was before his time. Among Maurice's works are 'Eustace Conway,' a novel (1834), 'The Epistle to the Hebrews'; 'Warburtoman Lectures' (1846); 'The Religions of the World'; 'Boyle Lectures' (1847); 'The Lord's Prayer,' sermons (1848); 'History of Moral and Metaphysical Philosophy' (1850-60); 'Ecclesiastical History of the First and Second Centuries' (1854); 'The World "Eternal," urging that "eternal punishment" is not "everlasting punishment" (1863); 'Casuistry, Moral Philosophy, and Moral Theology' (1866); 'The Conscience' (1868); 'The Lord's Prayer, A Manual' (1870). Consult the 'Life, chiefly told in his own Letters,' by his son (2 vols, London 1884); own Letters, by his son (2 vols, London 1884); Collins, W. E, 'Typical English Churchmen' (London 1902); Hughes, T., 'The Friendship of Books' (ib. 1873); Rogers, 'Men and Movements in the English Church' (ib. 1898).

MAURICE, SIR Frederick Barton, MAJOR-GENERAL, English soldier: b. 19 Jan. 1871 He entered the army in 1892, rose to captain in 1899 and brevet-major in 1900 He served in the Tirah campaign 1897–98 and in the South African War, 1899–1900. He accompanied the first British Expeditionary Force in the European Workley in France of 11 Acc. 1914 pean War, landing in France on 11 Aug. 1914, was "mentioned in despatches" and created K C. M. G. During 1915-16 hc served as Director of Military Operations on the Imperial General Staff, was awarded the French Croix de Guerre and made a commander of the Legion of Honor. On 7 May 1918 he published a letter in *The Times* contradicting certain statements made in Parliament by the Premier (Mr. D.

Lloyd George) and other ministers with regard to what had passed at the Allied War Council at Versailles The matter concerned the disposition of British troops and the strength of the army. The letter caused a great sensation and led to a "censure debate" in the House of Commons on 9 May 1918, in which the House rejected the Premier's motion for the appointment of a select committee to investigate the matter On 14 May the Army Council placed Major-Gen-eral Maurice on "retired pay." Though the letter had not been submitted to the Press Bureau before publication, in accordance with war-time regulations, no further steps were taken by the government. On his retirement General Maurice became military correspondent for the Daily Chronicle. In 1922 he became principal of the workingmen's college, St Pancras, London In a notable book, Forty Days in 1914, he traces the complicated and momentous campaign to the end of the battle of the Marne His other publications include 'The Russo-Turkish War, 1877-78'; 'Sir Frederick Maurice: A Record'; 'The Last Four Months' (1924); 'Robert E. Lee, the Soldier' (1925); 'Governments and War' (1926).

MAURICE OF NASSAU, Prince of Orange and Count of Nassau: b. Dillenburg, Nassau, 13 Nov 1567; d. The Hague, 23 April 1625. His father, William the Silent, was assassinated in 1584, and the 18-year-old boy was chosen stadtholder by the provinces of Holland and Zealand, and later by the other provinces, the command of the army being entrusted to him in 1587 by the States-General. He captured Breda, Zutphen and Nimeguen in 1590-91, and by 1597 had wrested the principal towns of the Netherlands from the Spanish. But Ostend was lost in 1604 and in 1609 a truce was made with Spain for 12 years. In 1618 he was made with Spain for 12 years. In 1618 he became Prince of Orange on the death of his brother Philip William Internal dissensions followed and Olden Barneveldt, leader of the aristocratic republicans and of the party of religious tolerance, was condemned to death (1619) on the charge of high treason, but actually because of his opposition to Maurice. The stadtholder renewed the war with Spain in 1621, immediately upon the expiration of the truce, and died at the very time he was negotiating an alliance with France and with England The greatest general of his day he was personally cold and unscrupulous See Holland and consult Kemp, C. M, 'Maurits v. Nassau, prins v. Orange in zijn leven en verdiensten' (4 vols, Rotterdam 1843); Nutting, M O., 'The Days of Prince Maurice' (Boston 1894); van Prinsterer, G. Groen, 'Archives ou correspondence de la maison d'Orange-Nassau' (1 series, 9 vols, Leiden 1841-61).

MAURICE OF SAXONY, DUKE AND ELECTOR OF SAXONY, German soldier: b. Freiberg, 21 March 1521; d. near Stevershausen, 11 July 1553 He succeeded his father, Henry the July 1553 He succeeded his father, Henry the Pious, as Duke of Saxony, in 1541; and although a Protestant refused to join the Schmalkald League In 1548, two years after a secret treaty with the Emperor Charles, Maurice was made Elector of Saxony. But he soon broke with the emperor, fathoming his sources of excellent the Correct and by purpose of crushing the German princes, and by a sudden show of force made Charles sign the Treaty of Passau, 31 July 1552. On the 9th of

July in the following year he defeated Albert of Brandenburg-Kulmbach, who had refused to accede to the Treaty of Passau, in the battle of Sievershausen, but died two days later of his wounds. Maurice was the foremost general and diplomat of his day in Germany, but he was entirely without scruple or principle, and played off one party against another until he was little trusted by either. Consult Brandenburg, E, ed, Politische Korrespondenz of the Elector Maurice (Leipzig 1904); id., Moritz von Sachsen (Leipzig 1898); von Ranke, L, Deutsche Gesschichte im Zeitalter der Reformation (ib 1882), The Cambridge Modern History, vol II (Cambridge 1903); Ascham, R, A Report and Discourse of the Affairs and State of Germany (1865).

MAURICIUS, mâ-rish'ī-ŭs, Flavius Tiberius, emperor of the East, 582-602 a d da b. Arabissus, Cappadocia, about 539 a d.; d. Chalcedon, Nov. 27, 602 a d d. He served with distinction against the Persians, and for his abilities and character was made successor to Tiberius II by that emperor, whose daughter, Constantina, he had married. His reign was filled with wars. In 591 he restored Chosroes II to the throne of Persia, thus bringing to a close the long campaign against that company. He was, however, one of the greatest and best of the Eastern emperors, a patron of the arts and sciences, and himself considerably learned. Phocas, one of his generals, commanding the army operating against the Avars, led a revolt against him, and he fled to Chalcedon, where he was murdered by Phocas' order. The Στρατηγικά, a work on military affairs, published in a Latin version by Scheffer at Upsala in 1664 was long attributed to him, but is really by some unknown contemporary. Consult Bury, J. B, The Later Roman Empire (London 1889); Finlay, G, History of Greece (Oxford 1877); Gibbon, E, Decline and Fall of the Roman Empire (London 1896).

MAURISTS, mâ'rists, the members of the Congregation of Saint Maur, to whom literature owes the stately tomes known as "Benedictine Editions" The Congregation had its origin in a reform of the Benedictines in the early part of the 17th century; it was supported by De Retz and afterward by Richelieu, and in 1720 possessed in France six provinces, contaming 180 abbeys and priories, of which the principal was that of Saint-Germain-des-Prés, Paris. Among the most celebrated of the Maurists are Mabillon, Martene, Montfauçon, the founder of the science of archaeology, Ruinart, Lami, Le Nourri and Martianay. Jansenism seems to have affected some of the convents, and, according to Badiche, a Masonic lodge was established at Glanfeuil in 1755, over which the prior of the monastery in that place presided The Congregation was suppressed in 1792. The last superior general with 40 members of his order perished by the guillotine. In their literary work they produced a great number of works of permanent value. Their complete bibliography comprises over 700 works by 220 authors. The Revolution put an end to the work, for which hundreds of volumes and literary documents had been collected. The Bibliothèque Nationale de Paris contains most of this material. Consult Helyot, Histoire des ordres religieux (1718); McCarthy, Principal Writers

of the Congregation of Saint Maur (1868); Tassin, Histoire littéraire de la congregation de Saint-Maur (Paris 1770).

MAURITANIA, mâ-rǐ-tā'nĭa, West Africa, colony in the government general of French West Africa. It consists of the districts of Trarza, Brakna, Gorgol, Guidimaka, Levrier Bay, Tagant, Assaba and Adrar Total area 347,400 square miles The population is about 300,000, the large majority of whom are nomad Moors In 1903 the French protectorate was extended over these districts; a provisional government with civil and military functionaries was formed under the name of Mauritania. Early in 1916 the region of Tibesti, recently occupied by the French, was attached administratively to French West Africa, the northern boundary limit is lat. 23° 3′ N.

MAURITIUS, mâ-rish'ī-ŭs, or ISLE OF FRANCE, an island colony of Great Britain, in the Indian Ocean, 500 miles east of Madagascar and 9,500 miles from England. It is of an earl form chapt 40 miles in length from north oval form, about 40 miles in length from northeast to southwest, and 25 miles in breadth; area, 720 square miles. There are numerous capes and bays along the shore and the island is surrounded by coral reefs It is composed chiefly of rugged and irregular mountains, rising into points of considerable height; the highest are the Montagne de la Rivière Noire, 2,730 feet, and the singular islated rock Peter Botte, 2,700 feet. Between the mountains, and along the coast, there are large and fertile plains and valleys, having a rich soil of black vegetable mold or stiff clay, watered by numerous streamlets, many of which become periodically dry. The climate is pleasant during the cool season, but oppressively hot in summer, and the island is occasionally visited by severe epidemics of fever The rainy season is from January to April; between December and March the island is subject to hurricanes and March the island is subject to hurricanes, occasionally of extraordinary violence. When discovered in 1505 the island was almost entirely covered with wood, the greater part of which has now been cut down for building purposes and exportation. The fauna then included the dodos, but otherwise was in no way remarkable. Some of the trees are valuable, particularly the black ebony. The indigenous vegetation includes orchids, screwpines, the traveler's-tree and bamboo. Many plants introduced from Europe, Africa, Madagascar and India thrive well, and nearly every beautiful tropical tree or delicious fruit is met with. The principal item of cultivation is sugar cane, and to a limited extent rice; but the most of the necessities of life have to be imported. The 1941 cane crop yielded 316,250 metric tons of I ne 1941 cane crop yielded 310,230 metric tons of sugar, compared with 229,460 metric tons in 1940. Other exports are rum, vanilla, coconut oil, aloe-fiber, spice. The total value of 1941 exports: Rs. 56,788,542 (rupee=\$0.30); imports, Rs. 41,977,050. Imports were rice, wheat, settens, behardschert, machinery, manuals contains the settens. ports, Ks. 41,97,000. Imports were rice, wheat, cottons, haberdashery, machinery, manures, carriages and parts, coal, iron and steel, etc. Letters patent of 1885, 1901, 1904, 1912 and 1933 established a partially representative form of government. The government of the island, with its dependencies, Diego Garcia, Rodrigues, etc. etc., is vested in a governor, an executive council, composing the commander of the forces, the colonial secretary, procurator general, receiver general and other persons in the public service, whom the governor may designate as members of the council. The council of government consists of the governor and 27 members, nine of whom are named by the governor, eight are ex-officio members and 10 are elected under a restricted franchise. Indians, nearly all Hindus, form a majority of the population (1938 estimate, 270,000). Churches receive state and.

The revenue for 1941–42 was Rs 23,661,338, and expenditure Rs. 22,122,292. The chief sources of revenue are the customs, licenses and permits, and the railways; the expenditure is chiefly on the civil service and on the failways, which have a total length of 144 miles. The currency is in rupees and cents Schools are kept up partly by government, partly by private agencies. In 1941 there were 51 government and 71 aided schools. The average attendance at government schools was 11,336 and 16,571 in aided schools. The highest institution is the Royal College, a school affiliated with London University. In 1940–41 the government expended Rs. 1,430,614 on education. The French language and French law prevail in the colony, and the majority of the white inhabitants are of French origin. Mauritius was discovered in 1505 by the Portuguese. The Dutch took possession of it in 1598, and named it Mauritius in honor of Prince Maurice. It eventually fell into the hands of the French, from whom it was definitely ceded to them in 1815. Principal towns, Port Louis, the capital, Curepipe and Mahébourg. Rodrigues, Diego Garcia, (Oil Islands group), and some other islands of the Indian Ocean are dependencies of Mauritius. The scene of Bernardin de Saint Pierre's celebrated Paul et Virginie is laid in this island. In 1941 the estimated population of the island, including dependencies, was 421,861. With more than 567 persons to the square mile, Mauritius is one of the most densely populated regions in the world. The Indian population originates from introduction of coolies to work the sugar plantations.

MAURITIUS HEMP. See FIBRE.

MAUROCORDATOS. See MAVROCORDA-

MAUROIS, André (pscud of EMILE SALOMON WILLIELM HERZOG), French writer: b. Elbeuf, Seine-Inferieure, France, July 26, 1885. After attending the junior lycée of Elbeuf and the lycée Corneille at Rouen, Maurois studied for a degree of philosophy at the University of Caen. From his 18th to 27th year he worked in his father's textile factory. During the First World War, he served as interpreter and liaison officer with the British Army, and his first book, Les Silences du colonel Bramble (1918) was a study of English military life. Although Maurois has written novels, essays, and histories, he is probably best known for his fictionalized biographies, including those of Shelly (Ariel, 1923), Disraeli (1927), Byron (1930), Dickens (1934). His pentrating gifts of observation, his urbane and sympathetic attitude, and his eclectic if rather superficial ability to treat the most varied subjects with interest and intelligence have won him a wide audience both in France and the English-speaking countries. In 1938 he was made a knight of the British Empire, and elected to the French Academy. From 1939 to 1940, he was attached to British GHQ as French eye-witness, and

after the tall of France, he went to the $\mbox{\it United}$ $\mbox{\it States}$

MAURY, ma'ıï, Dabney Herndon, Amer. ican military officer and engineer b. Fredericks bing, Va., May 21, 1822; d. Peona, Ill., Jan 11, 1900. He was graduated from West Point in 1846 and served in the Mexican Wat. He was brevetted 1st heutenant in 1847 for "gallant and mentorious conduct" at Cotto Gordo, and mentorious commer at certo Gordo, and served in the United States Military Academy as instructor, 1847 5.2. At the beginning of the Civil War he was brevet captain, but resigned to enter the Confederate Army, where he at tained the rank of department commander of the Army of the Gult. At Vicksburg in 1862 he was Sherman's opponent and subsequently had charge of the Department of Tennessee with the rank of major general. He again served the United States government when under President Cleveland's first administration he was minister to Colombia. He published Skirmish Drill for Mounted Troops (1859); Recollections of a Vnginian in the Mexican, Indian and Cool Wars (1891); Young People's History of Virginia and Virginians (1901).

MAURY, Matthew Fontaine, American naval officer and hydrographer; b. in Spottsylnaval officer and hydrographer; b. in sponsylvania County, Va., Jan. 14, 1806; d. Lexington, Va., Feb. 1, 1873. He studied at the Harpeth Academy in Tennesce, and entered the United States Navy in 18.75. During a voyage around the world in the *Vincennes* he began a treatise on navigation, long used as a textbook in the navy. He was made lieutenant in 1836. In 1839, when he was lamed by an accident he quitted active sea service for scientific work at the Naval Observatory. His powers of application were combined with tare gifts of imagina-tion, and an elevated style. His Physical Ge-ography of the Sca and Hs Meteorology (1855) has been considered a book of fascinating interest. In 1844 he published his views on the Gulf Stream, ocean currents and great-circle sailing. His 11 ind and Current Charts have been of immense benefit to navigation. In 1853 he reached the rank of commander, and in that year projected the maritime conference at Biussels, and also published Letters on the Amazon and the Atlantic Slopes of South America In 1801, when the Southern States second, he gave his services to the Confederate cause For some time he attached himself to the fortunes of the Emperor Maximilian in Mexico; but for the last few years of his life was professor of physics at the Virginia Military Institute. He was among the first to turn fresh attention to a branch of scientific inquiry which had been previously much neglected, the investigation of the depths of the sea, its currents, temperature, etc. He also published Lanes for Steamers Grosssing the Atlantic (1854), Consult Corbin Life of Matthew Fontaine Maury (London 1888).

MAUSER, Paul von, powl mow'zer, German inventor and gun-maker: b. 1838; d. May 29, 1914. He worked as a boy in the royal armory at Oberndorf, and there with his brother Wilhelm (d. Jan. 13, 1882) patented several improvements on the small arms then in use, both new needle guns and a model replacing the "needle" powerful percussion pin. The introduction of the Prussian needle gun into Würtemberg after the Austro-Prussian War deprived the brothers of the patronage of the

government, and in 1867 he settled in Liége, where he was financed by an American capitalist Paul invented the Mauser revolver in 1879 and the "Mauser" in 1882. He made the Turkish model in 1887, the Belgian repeating rifle in 1889, the Argentine model in 1891, the Spanish model in 1893 (adopted with slight change throughout South and Central America), and in 1896 a rifle for the Swedish army. Typical of his rifles are the Belgian model of 1889 and the Argentine of 1891, both magazine rifles with no cut-off, but capable of single fire by replacing the top cartridge in the magazine after each discharge. The magazine holds five cartridges, hes in front of the trigger guard and under the receiver, is fixed in type but easily cleaned. See SMALL ARMS

MAUSOLEUM (Greek, mausolcion), a tomb or burial place, the name of which is derived from Mausolus, a king of Caria, to whom a sumptuous sepulchic was raised by his wife, Artemisia, at Halicarnassus. King Mausolus died 353 BC; and his wife was so disconsolate that she perpetuated his memory by the erection of this magnificent monument which became so famous as to be esteemed the seventh wonder of the world, and to give a generic name to all superb sepulchies Its entire height was 140 feet, and the entire circuit 411 feet. It was overthrown, probably by an earthquake, between the 12th and 15th centuries; and when the Knights of Rhodes took possession of Halicarnassus in 1404 they availed themselves of the materials of the mausoleum to erect the fortiess of San Pietro Parts of the frieze were transported to the British Museum in 1846 Other famous mausoleums are that erected at Babylon by Alexander the Great in honor of Hephæstion, equally magnificent with that of Mausolus, though less refined; and the mausoleum of Augustus, built by him in the sixth consulate on the Campus Martius, between the Via Flammia and the Tiber, the ruins of which are still seen near the church of Saint Roque. One of the obelisks which stood before this superb building was found in the reign of Pope Sixtus ounding was found in the reight of Tope Saxtis V. This mausoleum contained the ashes of Augustus, Marcellus, Agrippa, Germanicus and of some later emperors. The mausoleum of Hadian at Rome is now the Castle of San Angelo. Consult Adler, 'Das Mausoleum zu Halikarnas' (Berlin 1900); Newton, 'History of Discoveries at Thickney Crides and of Discoveries at Halicarnassus, Cnidus and Branchide (London 1863); id., Travels and Branchidæ) (London 1863); id., 'Travels and Discoveries in the Levant' (ib. 1865); Smith, A H, 'Catalogue of Sculptures in the British Museum) (Vol. II, ib. 1900).

MAUSTON, Wis., city, Juneau County seat, alt. 883 feet, on the Chicago, Milwaukee, St. Paul and Pacific Railroad, 129m. NW. of Milwaukee. It handles the products of a dairy farming area, and engages in lumbering. The name was originally Maughstown. Pop. (1930) 2,107; (1940) 2,621.

MAUTHNER, mout'ner, Fritz, German novelist and philologist: b. Horzitz, Bohemia, 29 Nov. 1849; d. 29 Jan. 1923. Of Jewish family; went to Prague at an early age, studied law there and became a contributor (1876) of the Berliner Tageblatt for which he continued writing in various departments (particularly dramatic criticism) until 1905, when he retired from newspaper work and moved from Berlin

(where most of his active life was spent) to Freiburg im Breisgau, he lived at Meersburg on Lake Constance from 1909 While he has on Lake Constance from 1909 written novels and saturic romances, his greatest work is in the field of philosophical criticism of language as a means of expression; his position on this matter is best expressed in a large book. Beitrage zu einer Kritik der Sprache' (Vol. I, 'Sprache und Psychologie,' 1901; Vol. II, 'Zur Sprachwissenschaft,' 1901; Vol. III, 'Zur Grammatik und Logik,' 1902), and in an alphabetically arranged summary of the contents of this work, in dictionary form: (Worterbuch der Philosophie) (Munich and Leipzig 1910). His criticism is poetic and destructive rather than social in its import; his style smooth and brilliant His most famous work before he undertook scholarly production was 'Nach veruhmten Mustern' (Stuttgart 1878; 30th ed., 1902), a set of parodies of well-known German and foreign writers, in the manner of Bret Harte. In 1914 he the manner of Bret Harte In 1914 he published a collection of newspaper articles that had appeared in previous years, under the title, 'Gesprache im Himmel,' and in 1918 began the publication of an autobiographical work, the first volume of which deals with his schooldays in Bohemia and is a rather bitter attack upon the educational system of the time. Among other works are 'Vom armen Fran-ischko' (Dresden 1879); 'Die Sonntage der Baronin' (Dresden 1881); 'Der neue Ahasver' Baronin' (Dresden 1881); 'Der heute Allasvel' (Dresden 1881); 'Xanthippe' (Dresden 1884); 'Aturenbriefe' (Dresden 1885); 'Berlin W' (a cycle of three novels, Dresden 1886–90); 'Die bunte Reihe' (Munich 1896). There may be had, in English translation, 'Aristotle, an Unlistorical Essay' (New York 1906) On be had, in English translation, 'Aristotle, an Unhistorical Essay' (New York 1906) On Mauthner's philosophical doctrine, consult Wells, H. G, 'A Criticism of the Instrument' (appendix to 'A Modern Utopia' 1905).

MAUVAISES TERRES, mō-vāz těr. See BAD LANDS.

MAUVE, mov, an aniline purple coloring matter. See Dyes.

MAVERICK, Peter, American engraver: b. New York, 22 Oct. 1780; d. there, 7 June 1831. He studied engraving under his father, worked especially on bank-note designs and made famous engravings of Charles King's portrait of Henry Clay, of Waldo's portrait of Andrew Jackson and of Dunlap's portrait of Benjamin Moore. Maverick was one of the founders of the National Academy of Design in 1826 His most celebrated pupil was Asher B. Durand.

MAVERICK, an unbranded steer, especially one appropriated by a chance finder. This term, in common use in the cattle country of the United States, is said to be derived from the name of Samuel Maverick, a Texas lawyer and politician, who, having accepted a herd of 400 head of cattle in payment of a debt, left them in charge of one of his men. They were neglected and allowed to run wild and when the calves were born they were of course appropriated by other ranchers and branded with their marks, and so passed to their undisputable ownership. As the ownership of the cattle was determined by the brand, it may easily be seen why the name "Maverick's" was given to all calves caught straying from the herd. From

this use of the word grew a wider application to anything dishonestly come by.

MAVIS, the Scottish name for the British songthrush or throstle (qv), one of the favor-

ite song-birds of western Europe.

MAVOR, James, Canadian economist b. Stranraer, Scotland, 8 Dec. 1854; d. 31 Oct. 1925. He was graduated from the University of Glasgow. He was for a time editor of the Scotish Art Review; in 1888 became professor of political economy at Saint Mungo's College, Glasgow, and in 1892 professor of political economy at the University of Toronto, Canada. He wrote 'Wages Theories and Statistics' (1888); 'Economic Theory and History Tables and Diagrams' (1890); 'Currency Reform' (1891); 'Economic Study and Public and Private Charity' (1892); 'English Railway Rate Question' (1894); 'Railway Transportation in America' (1909); 'Economic Survey of Canada' (1914); 'Applied Economics' (1914); 'A Short Economic History of Canada' (1915)

MAVROCORDATOS, mav"-rō-kŏr-da'-tŏs, or MAUROCORDATOS, Alexander, modern Greek saldar and modern Greek soldier and statesman: b Constantinople, Turkey, 15 Feb. 1791; d. Ægina, 18 Aug 1865 He was a skilful linguist and early schooled in diplomacy. On the outbreak of the Greek war for independence (1821), he devoted his entire fortune to the equipment of a ship and the arming of volunteers. He organized the insurrection in Ætolia and Acarnania, was made president of the National Assembly at Epidaurus, drew up the provisional constitution and signed the proclamation of independence (January 1822). He also became president of the executive council, but resigned in what he believed to be the interests of harmony In 1833-34, 1841-43, 1844 and 1854-56, he was at the head of the Cabinet and in 1850-54 was Ambassador at Paris. He promoted public education and was a Liberal in politics, being of the British party and opposed to the Russian policy of Giovanni and Augustin Capo d'Istria He is generally considered the most important leader in the Greek Revolution. Consult Browning, Oscar, 'History of the Modern World' (Vol. I, New York 1912).

MAWSON, Sir Douglas, Australian geographer b. Bradford, Yorkshire, 1882 He was educated at Sydney University, where he was graduated bachelor of mining engineer in 1901. In the following year he was demonstrator in chemistry there. In 1903 he made a geological exploration of the New Hebrides and lectured at Adelaide University in 1905. In 1908 he became a member of the scientific staff of Sir Ernest Shackleton's Antarctic Expedition and determined the position of the south magnetic pole on Victoria Land. In 1911-14 he was leader of the Australasian Antarctic Expedition to explore Antarctic lands and establish stations for scientific purposes. His discoveries were among the most important made so far in the 20th century. In 1915 he was awarded the founder's medal of the Royal Geographical Society and was knighted in 1914. He has published 'The Home of the Blizzard' (2' vols., Philadelphia 1915) and scientific papers in the transactions of learned societies. For a detailed account of the explorations directed by Mawson see Antarctic Regions.

MAX, mäks, Gabriel von, German painter: b Prague, 23 Aug. 1840 The son of a sculptor, with whom he studied for a time, he soon devoted himself to painting, then went to the Prague Academy under Engerth's teaching, and, after several years at Vienna, became a pupil of Piloty in Munich, where he was professor in the Academy from 1879 to 1883. His work is largely fantastic; he aimed to interpret music especially that of Beethoven, Mendelssohn and Liszt, and was fond of psychic themes, although occasionally, as in his famous pictures of monkeys, going to an extreme of realism, explained by his carnest belief in Darwin and Haeckel But he is best known for his historical and figure paintings, which usually show a female figure of some beauty and ethereal charm, with dreamy, longing, sentimental eves In such pictures as these the flesh tones are particularly remarkable, being sometimes styled marble-like and due to his early training as a marble-like and due to his early training as a sculptor and again described as a twilight of sentiment, typilying the spiritual. To this class belong 'Spirit Greetings' (1879); 'The Last Token,' now in the Metropolitan Museum, New York (1874); 'Nydia' (1874), 'Veil of Saint Veronica' (1874); 'The Lion's Bride,' in the Museum of Manchester (1875), and many book illustrations, notably, those for Schiller's and illustrations, notably those for Schiller's and illustrations, notably those for Schiller's and for Lenau's poems, for Goethe's 'Faust' (the 'Marguerite before the Mater Dolorosa' being especially well known), for Wicland's 'Oberon' and for Uhland's works. Max was ennobled in 1900 Consult Klemt, 'Gabriel Max und seine Weike' (Vienna 1887): Mann, N, 'Gabriel Max, Kunst und seine Werke' (Leipzig 1888); and Meissner (in 'Die Kunst unserer Zeit,' Munich 1890) Munich 1899).

MAXENTIUS, mak-sen'shi-us, Marcus Aurelius Valerius, Roman emperor d. 27 Oct. 312. He was the son of Maximianus, and in 306 a.d. was proclaimed Augustus by the prætorians and acknowledged by the people and Senate of Rome, to whom Galerius had become hateful. Severus, sent by Galerius against him and his father, was compelled by Maximianus to retreat to Ravenna and was put to death in 307. Galerius was likewise compelled to retreat and Maxentius, availing himself of an insurrection of the Africans under a certain Alexander, in 311 declared war against Constantine the Great. While Constantine pressed forward into Italy, Maxentius himself remained inactive at Rome and did not go out to meet Constantine till he had passed unopposed across the Apennines. At the great battle fought shortly after at Saxa Rubra near Rome, Maxentius was defeated and perished in the Tiber as he tried to escape over the Mulvian Bridge. See Constantine; Rome — History.

MAXEY, Samuel Bell, American soldier: b. Tompkinsville, Ky., 30 March 1825; d. Texas, 16 Aug. 1895. When Maxey was a child his parents removed to Paris, Tex, where the son was educated until prepared to enter West Point, from which he was graduated in 1846, assigned to the infantry and at once sent to Mexico. He took part in the campaign from Vera Cruz to the City of Mexico and was brevetted for bravery at Contreras. As soon as the war was ended Maxey resigned to begin the practice of law. For 12 years he practised

in Kentucky and Texas He entered the Confederate service as colonel of the 9th Texas Infantry and was engaged in the campaigns east of the Mississippi River under A S Johnston, Bragg and Joseph E Johnston In 1862 he was made brigadier-general In 1863 he was sent to command the Indian Territory He raised and equipped numbers of troops, kept the Indians friendly to the Confederacy and in 1864 he drove back the Federal general, Steele, who was endeavoring to effect a junction with Banks in the Red River Valley For this he was made major general After the war he was offered a Supreme Court judgeship in Texas but declined. From 1875 to 1887 he was in the United States Senate Maxey was an able senator, a member of the prominent interests

MAXIM, SIR Hiram Stevens, Auglo-American inventor b Sangerville, Me, 5 Feb 1840; d. London, England, 24 Nov 1916. As a boy he received his early education in the country schools of Maine What little spare time he had after attending to his work on the farm and in his father's workshop was spent at the nursuit of scientific Luowledge. Without m the pursuit of scientific knowledge. When he was 14 years old he was sent as an apprentice to a carriage builder at East Corinth, Me Later, while employed in a laboratory in Boston, he perfected his first invention, a method of carburcting air and gas for lighting pur-poses His invention was used in many New York hotels. Others of his inventions included electrical devices, improvements on incandescent lamps, self-registering current machines and other similar contrivances. When he was 28 years old he was employed as a draughtsman in a shipbuilding firm in New York City. While there he invented a locomotive headlight, which was used generally. In 1884 Maxim perfected the automatic rifle, or machine gun, in which the recoil due to the explosion of one cartridge was utilized to eject the empty shell and at the same time reload the weapon. The inventor was then in England. The government, interested at once in the possibilities ernment, interested at once in the possibilities presented by the rifle, adopted it. It was the Maxim gun that was an important factor in winning the Egyptian campaign for the English. It is now used by the armies throughout the world. Closely following came the "disappearing gun," cordite and other smokeless powders, a gun for hurling aerial torpedoes and the "delayed action" fuse. For many years Sir Hiram experimented with aeronautics In 1894 he succeeded in building a heavier-than-air machine. At that time when aeroplanes were machine At that time when aeroplanes were only thought possible, Sir Hiram Maxim critiused the British nation for lack of interest in aeronautics and predicted that a bombardment of the island from airships was possible. Sir Hiram held membership in the American Society of Civil Engineers, the Royal Society of Arts, the British Association for the Advancement of Science and many other bodies. He became a naturalized citizen of Great Britain because of alleged unfair treatment of his inventions by the American government. Sir Hiram Stevens Maxim will be remembered as one of the foremost inventors of his day. In 1881 President Grevy of France made him a Chevalier of the Legion of Honor. This decoration was followed in 1901 by recognition by

the British government, Queen Victoria elevating him to the knighthood.

MAXIM, Hudson, American inventor and engineer. b. Orneville, Me., 3 Feb. 1853; d. 6 May 1927. After an academic education with especial reference to the natural sciences and engineering, he took up the study of medicine; entered the printing and subscription book publishing business at Pittsfield, Mass, in 1883, but gave up the publishing business in 1888 to take up business of ordnance and explosives. He was the first to make smokeless gunpowder in the United States and was the first to submit samples to the government for trial. In 1890 he built a dynamite factory and smokeless powder mill at Maxim, N. J., named for him. It was there that the multi-perforated smokeless powder was developed and perfected under his inventions and patents, which was adopted by the United States government These patents were purchased by the E. I du Pont de Nemours Powder Company, of Wilmington, Del., in 1897. He invented the process of making calcium carbide by incandescence of molten carbide conductor, now in general use. In 1901 he sold United States government the secret of the high explosive Maximite invented by him (see Explosives); invented United States service detonating fuse for high explosive projectiles. He invented the system of driving torpedoes by steam and products of combustion of a self-combustive compound called motorite, the steam being generated by the motorite. This system was purchased by the United States navy. In 1898 he became consulting engineer for E. I. du Pont de Nemours Powder Company He invented stabillite (qv), a smokeless powder made without volatile solvent, which consequently requires no drying. He received the degree of D.Sc. from Heidelberg University, Ohio, in 1913. He was a member of consulting board of United States navy; of Albany Burgesses Corps (rank, captain); of Military Service Institution; of Society of Chemical Industry; of Chemists Club; of Aeronautical Society; Fellow A. A. A. S. of Society of Applied Psychology. He published (The Science of Poetry and the Philosophy of Language) (1910); 'Defenseless America' (1915); 'Dynamite Stories' (1916). lite (qv), a smokeless powder made without

MAXIMA AND MINIMA. The maxima and minima of a function f(x) are the points of the curve y = f(x) where y is larger or smaller, respectively, than for any value of x differing from the value at that point by less than some finite number. According to this definition, a curve may have several maxima or minima, and a maximum or minimum need not be a point where y assumes the greatest or least value, respectively, throughout the entire curve. It is easy to see that a maximum is a point where the curve ceases to go up and begins to go down. At such a point, the slope of the curve, or the differential coefficient $\frac{dy}{dx}$,

changes sign If $\frac{dy}{dx}$ is continuous at a maximum, it can only be 0, and at any rate, on an algebraic curve, it can only be 0 or ∞ Thus the maxima—likewise the minima—are all to

be found among the points where $\frac{dy}{dx}$ =0 or ∞ .

If $\frac{d^2y}{dx^2} > 0$, we have a minimum, of $\frac{d^2y}{dx^2} < 0$, a maximum. However $\frac{dy}{dx}$ may be 0 or ∞ without their being a maximum or minimum at the point. In this case $\frac{d^2y}{dx^2}$ will be 0. To determine whether we have a maximum, a minimum or neither when $\frac{d^2y}{dx^2} = 0$, higher derivatives must be considered.

tives must be considered

The definition of the maxima and minima of a function of two variables is obvious It is clear that a necessary condition for a maximum or minimum of f(x, y), at a point where its partial derivatives are continuous, is that $\frac{\partial f}{\partial x} = \frac{\partial f}{\partial y} = 0$ A sufficient condition for a maximum is $\left(\frac{\partial^2 f}{\partial x \partial y}\right)^2 < \left(\frac{\partial^2 f}{\partial x^2}\right) \left(\frac{\partial^2 f}{\partial y^2}\right)$ and $\frac{\partial^2 f}{\partial x^2} < 0$.

A sufficient condition for a minimum is $\left(\frac{\partial^2 f}{\partial x \partial y}\right)^{\circ} < \left(\frac{\partial^2 f}{\partial x^2}\right) \left(\frac{\partial^2 f}{\partial y^2}\right)$ and $\frac{\partial^2 f}{\partial x^2} > 0$.

Some important theorems in plane geometry having to do with maxima and minima are that of all polygons having a given perimeter and a given number of sides the regular one has the greatest area, that a circle has a greater area than any other figure with the same perimeter; that a right triangle is larger than any other with two sides equal to its legs, and that of all triangles with a given perimeter and a given base, the isosceles is the greatest See CALCULUS, THE INFINITESIMAL; CALCULUS OF VARIATIONS.

MAXIMALISTS, or BOLSHEVIKI, the name applied to the adherents of the extreme Socialist party which, headed by Lenin and Trotzky, overthrew the provisional government and the Soviet leaders in Russia on 7 Nov. 1917. The words "Bolshevik" (sing), "Bolsheviki" (plural) and "Bolshevism" are not explanatory terms and have nothing to do with the policy or aims of the party. Their origin dates from the second conference of the Russian Social-Democratic party in 1903, at which the methods to be adopted in regard to revolutionary activity were under discussion. A sharp line of cleavage made itself evident; and when voting on the resolutions took place there was naturally a majority (bolshinstvó) and a minority (menshinstvó). From that moment the groups were called Bolsheviki and Menshiviki (maximalists and minimalists). The majority represented the extremists, the "whole-hoggers" of Socialism (bólshě—more), or those who go for the biggest things; while the minority represented the "moderates" or "thin-end-of-wedge" theorists (ménshi—less, smaller), or those whose aims are of smaller intent. There appears to be no evidence that the terms existed or were current before 1903, though the Russian Social-Democratic party was founded by Plekhanov and others in Switzerland in 1884. The abortive revolutionary movement of 1905–06, which opened with the Putilov ironworks strike and the Father Gapon episode, served to widen the breach between the two factions to the extent that in 1907 the party was def-

initely split into two independent groups—Bolsheviki and Menshiviki. The former, following in part the teachings of Karl Marx, were led by Lenin The Marxian revolution was essentially a class revolution, to the realization of which nationalism was regarded as an obstacle. The European War and the aftermath of the Revolution of March 1917 revealed the wide divergence existing between the aims and methods of the two groups. The Bolsheviki contracted the class distinction to narviki contracted the class distinction to narrower dimensions and looked upon the educated classes, the *bourgeoisse*, and even the peasants as enemies. Their aim was radical internationalism; they sought not the re-creation of Russia, but the triumph of one class throughout the world—the proletariat; in other world, mob-rule. For the most part they were lutter and and doctrinaites reeliging. they were bitter and and doctrinaires, reeling off strings of long, high-sounding words and phrases which few understood, and clinging to a vague and abstract creed with fanatical devotion. Every problem was met by a reference to the letter of their law and interpreted accordingly. But whatever political, social or economic creed the Bolsheviki professed on paper, their activity - and by that alone can they be judged—consisted merely of a wild orgy of crime, plunder and treason. No trace of practical ability was revealed by any of their leaders, but they had the driving force which even the shallowest fanaticism can give They were opposed to the war, which they de-clared to be "imperialistic" and "bourgeoise" They were opposed (on principle) as much to a German peace as to a peace dictated by the Allies "No indemnity, no reparation and no annexation" became their ideal The Menshiviki were of a saner type; while claiming for the working classes the importance due to their numbers, they did not ignore other classes. Holding in view definite practical reforms, they were willing to utilize the existing machinery of the state for their purpose. They accepted the war and its vigorous prosecution as a part of their program and realized that nationalism must precede internationalism They recognized that the cause of the Allies was also then cause, and in this belief they were undoubtedly supported by the more intelligent Russian Social-Democrats To the Bolsheviki the fate of their country mattered nothing, provided only that their own crude ideas of social reconstruction survived the ordeal They were eager for peace on any terms in order that they might proceed with their own program, that class war which recognized no political frontiers not national consciousness After the fall of Kerensky the Bolsheviki began their career as rulers by the wilful and systematic destruction of the Puscing army and systematic destruction of the Russian army and navy. Their leaders posed before the world as the elect champions of a new idealism which was to redeem mankind. They proposed to teach other democracies the true and saving doctrine of the real revolutionary creed Of exercising government, as that term is understood among civilized peoples, they proved themselves utterly incapable; government, in fact, holds no place in their system, of which the sole principle is civil war or, as they term it, "class war" Though it owes its genesis to Socialism (from which it is really far removed), Bolshevism may be described as a com-

gound of anarchism, syndicalism, hatred and blind fanaticism. Needless to say, ingredients of this type cannot fail to attract all the purely criminal elements which, in normal times, are held in check by the torces of law and order. With the removal or breakdown of that salutary check and the absence of an efficient substitute. a free rein is given to unbridled passions by which a political movement is converted into a mere caimival of terrorism. This was what happened in Russia in 1917. The Bolsheviki had nothing whatever to do with bringing about the revolution which swept away the autocracy in March of that year. That revolution was neither engineered nor organized; it sprang not from the burning inspiration of a new faith, but succeeded almost automatically from sheer weatiness, tited in mind and body, Russia had lost nerve and heart. The provisional government that was formed on 16 March consisted of honest, patriotic and intelligent men-Prince Lvov, Guchkov, Milyukov, Terestchenko, Nekrasov, Shingarev and Kerensky, who was the only Socialist in the group. Of all these, Kerensky proved to be the only «man of destiny" with sufficient magnetism to compel a following Their first energies were devoted to maintaining discipline in the army and carrying the war to a successful conclusion. But already in September 1915 Lenin had issued the Zimmerwald manifesto, signed by himself and the Swiss Socialist, Robert Grimm, calling for «peace without annexations or indemnities. German agents had sedulously spread this doctrine among the Russian rank and file, with the result that the idea of a peace so easily to be gained soon won a large number of converts. It was easy for German propagandists to convert the working classes to this view. The people were told what they wanted to hear - that it was folly to fight longer and that their Western Allies were the time foes of Russia, since they sought to force her to remain in the war. Not only did demoralization of the army set in, but there also grew up a spirit of hostility against the Allies, especially Great Britain. Thus, while the provisional government and later Kerensky alone struggled to maintain order and national unity, Bolsheviki and German agents were underminmg the structure with glowing promises and sedition On 16 July 1917 the Bolsheviki in Petrograd, led by Lenin and Trotzky, attempted to seize the reins of government and failed. Lenin disappeared when warrants were issued for the arrest of the Bolshevist leaders At the last moment Kerensky weakened; re-garding the Bolsheviki as «political opponents,» he countermanded the order for their arrest.

Up to this time the Russian armies were still fighting in the field; their offensive in Galicia was nearing its disastrous climax and Bolshevism—the foe of the revolution and an enemy of the people—was growing in momentum. Confusion spread; Kerensky denounced the counter-revolutionists and those who unwittingly encouraged anarchy (Moscow, 25 Aug. 1917), which caused a wider split among his uneasy team. General Korniloff arrived from the front and stated that the military disasters were due not to the revolution but to the follies of the revolutionaries; that discipline must be maintained both at the front and in the rear. His gloomy picture of a de-

graded and defeated Russia had no terrors for the Bolsheviki. After three days of palaver the conference talked itself to a standstill with no result. Meanwhile, the German armies found no difficulties in overrunning northern Russia and seizing Riga. Kerensky again wavered His fatal error in the Korniloff affair drove the few remaining moderates out of his Cabinet and gave the Bolsheviki their opportunity. The retreating Russian armies gave themselves up to pillaging their own people and the sailors of the Baltic fleet murdered their own officers. Lenin crept out of hiding and raised his voice afresh in Kronstadt—the worst nest of anarchy. Kerensky once more fulminated against the Bolsheviki and then informed the United States that Russia was worn out. The dark forces waiting in the shadows quickly observed the change and made their preparations. The apathy and despair of Russia made her an easy victim to a body of determined men. Trotzky, then president of the Petrograd Soviet, summoned the proletariat of all nations to do what had been done in Russia; he decided to make peace with a willing Germany and to raise his party to the supreme power. On 5 Nov. 1917 the Military Revolutionary Committee ordered the Petrograd garrison to place itself under their instituctions. Kerensky suppressed the chief Bolshevist paper and called on the loyal troops to defend the government On the 6th the military cadets occupied stations, bridges and telegraph offices and threw a cordon around Kerensky's residence, the Winter Palace. Lenin arrived the following day with his leading spirits and made the Smolny Institute (a girls' school) the Bolsheviet bedding the Manager the second of the Bolsheviet beddington. shevist headquarters. He issued a proclamation announcing the fall of the government. The majority of the troops went over to the Bolsheviki. Kerensky fled on the 7th, leaving a guard of cadets and some women at the Palace. The Bolshevist troops (Red Guards) captured the palace, committed many brutalities on the inmates and in a few hours the whole of Petrograd was in their hands. The «new government» was placed in the control of a «Council of People's Commissioners,» of which Lenin was appointed president, Trotzky foreign minister and Ensign Krylenko as commander-in-chief of what was left of the army.

The comparative ease with which the Bolsheviki overturned the provisional government was due mainly to the passive attitude of the troops. Had Kerensky had at his disposal a few brigades of reliable troops he might as easily have crushed Bolshevism on the same day. On 8 November Lenin telegraphed to all the belligerent governments a proposal for a three months' armistice. On the 10th a series of decrees began to emanate from the Smolny Institute, their principal features being the spoliation of one class and the transference of its property to another. Municipalities were empowered to sequestrate all houses, whether inhabited or not, and to install in them citizens possessing no abode or occupying crowded or insanitary dwellings. All factories were passed to the possession of the operatives (syndicalism), and a moratorium was proclaimed for the payment of rent for small houses and lodgings. The most important decree threatened civil war in the rural districts by declaring all private ownership in land to be annulled without compensation to the owners The land was to be nationalized and handed over to the cultivators, while for the present all lands belonging to the state, to the Church and to monasteries, etc, with all appurtenances — flocks, herds, machines, etc, were to be placed at the disposal of the local agrarian committees until the meeting of the Constituent Assembly The local meeting of the Constituent Assembly soviets were authorized to preserve order during the process of confiscation All mines, forests and waterways were acquired by the state, and the smaller woods, rivers and lakes were to be the property of the village com-munes The gloom of Bolshevism had settled over Russia. Missionaries of that cult were dispatched to all European countries and to the United States to spread the faith and incite proletariat uprisings, though with negligible success During 1918-21 the dread of "Bolshevism" became a haunting spectre to not a few Everywhere outside of Russia governments. it was denounced by public men and its slightest symptoms rigorously suppressed. It is a remarkable fact that, while Jews formed a large percentage of the leading Bolsheviki, over 90 per cent of Russian Jews were hostile to them. Many of them had lived in America, Switzerland, Great Bittain, France, Germany and the Scandinavian countries. They returned to Russia after the Revolution, where their ranks were swelled by large numbers of exiles from Siberia — not all political offenders, but also some of the most dangerous criminals (The further adventures of the Bolsheviki régime are told adventures of the Boisneviki regime are told under Russia—History, see also Russia—During the World War, War, European; Kerensky; Korniloff; Trotzky; Lenin). Consult Trotzky, L, 'The Bolsheviki and World Peace' (New York 1918); The World's Work (New York, October 1918); Current History (New York, November-December 1918).

MAXIMIANUS I, māk-sim-i-ā'nus, Marcus Aurelius Valerius, Roman emperor: d. February 310 A. D. He so approved himself by his services in the army that Diocletian selected him for his colleague, creating him first Cæsar (285), then Augustus (286) and at the same time conferred on him the honorary appellation of Herculius. Maximianus had the care of the Western Empire, while Diocletian undertook that of the Eastern In 287 he was consul with Diocletian, and in the same year conducted a campaign in Gaul. After conducting several wars, in 303-304 he was for the seventh time made consul, having for his colleague Diocletian for the fifth time, with whom he abdicated. 1 May 305. In the following year he was again invested with the imperial title by his son Maxentius, to whom his services against Severus and Galerius were of the most important kind. His son shortly after expelled him from Rome, and repairing to Gaul, in 308 caused himself to be proclaimed Augustus at Mar-seilles, but Constantine easily deposed him. See Constantine; Diocletian.

MAXIMILIAN I, măk-sǐ-mìl'ī-an (Ger. maks-ē-mē'lē-ān), emperor of Germany: b. Neustadt, near Vienna, 22 March 1459; d Wels, in Upper Austria, 12 Jan. 1519. He first became an independent prince by his marriage with Mary of Burgundy, the daughter of Charles the Bold, who died in 1477. This match involved him in a war with Louis XI,

King of France, in which he was successful, though he was defeated at a later period by the Milanese. At Frankfort in 1486 he was chosen king of the Romans and two years later was imprisoned by the Flemings at Bruges. He secured the Tyrol in 1490 and in the same year made war against Charles VIII of France. In 1493 he became Holy Roman emperor on the death of his father. He was involved in war with Venice, France and Switzeiland for the greater part of his reign. He was succeeded by his grandson, Charles V. Consult 'Cambridge Modern History' (Vol. I, 1903), and Heyck, 'Kaiser Maximilian 1' (Bieleteld 1898).

MAXIMILIAN, emperor of Mexico. known in earlier life as Ferdinand Maximilian Joseph, Archduke of Austria. b. Vienna, 6 July 1832; d Queretaro, Mexico, 19 June 1867. He was the younger brother of Francis Joseph I, emperor of Austria (qv) He entered the Austrian navy in 1846, and in 1854 obtained the rank of rear-admiral and was placed at the head of the Austrian marine. He was viceroy of the Lombardo-Venetian kingdom in 1857-59 and in 1857 married Princess Charlotte of Belgium, daughter of King Leopold I. On his return from a voyage made to Brazil for scienin the vicinity of Trieste, and their, 3 Oct. 1863, received a deputation from the Mexican Assembly of Notables, who offered him the crown of their country. He officially announced his acceptance 10 April 1864. He landed at Vera Cruz on 28 May and entered Mexico on 12 June. He set himself energetically to consolidate and develop his dominions, granted an amnesty to political offenders and exhibited great interest in religious worship and education. But he failed to conciliate the Republican party, and as he did not restore to the clergy their confiscated estates they pronounced him a traitor. Meanwhile there were incessant conflicts between the partisans of President Juarez and the allied French and imperal troops; and the decree of 2 Oct. 1865, by which the members of the Juarist bands and those who abetted them were to be regarded as bandits and shot, alienated the party of the Liberals. Juarez raised the standard of inde-pendence. Complications and misfortunes thickening around Maximilian tendered his position critical in the extreme. The empress in vain undertook a mission to Europe to enlist support for her husband, and grief and disoverthrew her reason The appointment French troops, largely by reason of the representations of the United States government, were withdrawn by Napoleon in March 1867; but Maximilian decided to remain in the hope of being able to maintain the empire. bravely defending Queretaro against a Liberal force under Escobedo, he was betrayed by General Lopez on the night of 14 May 1867. Tried by court-martial, he was sentenced, with his principal officers, to be shot. The sentence was carried into effect on the morning of 19 June. Maximilian's body was after some delay surrendered to his relatives, and his funeral was celebrated with great pomp in the cathedral of Vienna on 18 Jan 1868. Maximilian was a man of eminent abilities and high and varied culture. His collected writings are contained in a posthumous publication entitled

(Aus meinem Leben Reiseskizzen, Aphorismen. (Aus meinem Leben' Reiseskizzen, Aphorismen, Marinebilder) (1867), which gives ample testimony to the vigor of his intellect and the variety of his attainments (See Mexico, History). Consult Bancroft, H. H. (History of Mexico) (6 vols, San Francisco 1883–88); (Cambridge Modein History) (Vol. II, New York 1909); Kemper, J., (Maximilian in Mexico) (Chicago 1911), Martin, P. F., (Maximilian in Mexico) (London 1914) imilian in Mexico' (London 1914)

MAXIMILIAN, Joseph, 1st king of Bavaria b Schwetzingen, Baden, 27 May 1756; d Nymprenburg, near Munich, 13 Oct 1825 He succeeded his uncle, Charles Theodore, as elector in 1799 He was a supporter of Napoleon, and gave his daughter in marriage to Eugene Beauharnais in 1806. In the same year his duchy was erected into a kingdom. In 1813, however, he was member of the league against the emperor, and thus retained his throne after the fall of Napoleon His reign was distinguished by the introduction of many administrative reforms, especially the constitution of

MAXIMINUS, māk-sī-mī'nus, Caius Ju-lius Verus, Roman emperor d. Aquileia, 238 AD He was at first a shepherd in Thrace and when about 20 years of age became a soldier in the Roman armies, where he was distinguished by his gigantic stature. His capacity for fighting procured him rapid advancement, and under Alexander Severus he had the command of a legion on the Rhine In 235 Ar. he took part in a conspiracy against Alexander, and after his murder of the latter by the soldiers was proclaimed emperor. The Gordian having been proclaimed in Africa, Maximinus hastened to Italy and laid siege to Aquileia. He was there murdered by his soldiers.

MAXIMITE, a high explosive employed as a bursting charge for projectiles, invented by Hudson Maxim (q v.) of New York City The secret of the invention and the exclusive right to the use of the explosive was purchased by the United States government in 1901, after very exhaustive trials at Sandy Hook proving grounds Maximite was the first high explosive to be successfully employed as a bursting charge for armor-piercing projectiles. This explosive, while it is claimed to be 50 per cent more powerful than ordinary dynamile, is so insensitive that it will not only safely withstand the shock of discharge from the gun, but will also stand the far greater shock of penetrating armorplate as thick as the projectile containing it is capable of passing through, the projectile being then exploded immediately behind the plate with a delay action detonating fuse.

Ignited in the open, maximite simply burns like pitch. Projectiles are charged with it by the simple process of melting and pouring, the explosive solidifying on cooling, and adhering firmly to the walls of the shell. Maximite is known to be a picric acid compound. See Ex-

PLOSIVES; PROJECTILES

MAXIMS. The 'Maxims' of La Rochefoucauld furnish the most famous body of examples of that polished and studied condensation of expression to epigrammatic sparkle and brilliance in which the French so delight and so excel, and of which the 'Pensées' of Pascal, the 'Caractères' of La Bruyère and the 'Reflexions) of Vauvenargues are other specimens.

They are precisely what their fuller official title proclaims them: Reflections, or Sentences and Moral Maxims ('Réflexions, ou Sentences et Maximes morales'). They are moral in the sense that they are concerned with the facts of human conduct and motive, but not at all in the sense of serving a didactic purpose or in proposing an incentive or a guide to virtuous living; and they are reflections rather than maxims in the ordinary meaning of the word, since what they give us is not practical precept and counsel, but an analysis of moral facts. In this analysis the sharp distinction and opposi-tion between vice and virtue disappears. His moral philosophy is summed up in the maxim that stands as epigraph at the head of the collection "Our virtues are most frequently but vices disguised" The idea is restated a little more specifically in the first reflection: "What we term virtue is often but a mass of various actions and divers interests which fortune, or our own industry, manage to arrange, and it is not always from valor or from chastity that men are brave, and women chaste" The root of all our actions, mask it as we will, is selfishness. This view of virtue and vice may owe something of its bitterness and pessimism to the personal temper of La Rochefoucauld, soured by disappointment after playing a restless and unsuccessful part in political and private intrigue. But it owed much also to his penetrating observation of the life of court and salon, and even those who wanted to think more generously of human nature admitted sadly the accuracy of his analysis, while all were captivated by the concision and elegance of his style. To this he gave unending care, polishing and refining his sentences, rejecting some and adding others in successive editions (1665, 1666, 1675, 1678) The standard edition is that prepared by M. Gilbert (Paris 1868). The Maxims have had many admirers among English writers, as Addison, Swift, Dr. Johnson and Lord Chesterfield. They have often tempted to translation A late and complete English version is by J W. Willis Bund and J. Hain Friswell (London 1871)

ARTHUR G CANFIELD

MAXIMS, Legal, epigrammatic statements of established principles in law, as "Ignorance of the law excuses no one" (Ignorantia legis neminem excusat) They are of historic and practical value, and are common in both law and equity. Usually they are given in Latin or in English, but occasionally they appear in French. The following are some of the most important which appear generally in English: "Equity treats that as done which ought to be done"; 'He who comes into equity must come with clean hands"; "Who seeks equity must do equity"; 'Acts indicate the intention"; "Where there is equal equity, the law must prevail." The following usually appear in Latin: Qui facit per alium facit per se ("He who acts through another acts himself"—important in the law of agency); Affirmantis est probare ("He who affirms must prove"); Causa proxima non remota spectatur ("The immediate and not the remote cause is to be considered — important in the law of torts). While maxims are of importance in the law to-day, it is nevertheless true that some of them, through legal changes, are practically obsolete. Due

allowance also must be made for the fact that they do not contain exceptions and amplifications of the principles they state; otherwise they are very likely at times to be misleading.

MAXIMUM DUTIES. See Duly

MAXIMUS MAGNUS, Roman emperor: b in Spain; d 388 In 383, while commanding the Roman army in Britain, he proclaimed himself emperor. Gratian marched against him, but was defeated and assassinated, and Maximus, having made himself master of Gaul, Britain and Spain, fixed the seat of his empire at Treves He then advanced into Italy and was besieged in Aquileia by the Emperor Theodosius, who caused him to be beheaded

MAXWELL, Sir Herbert Eustace, 7th Baronet of Monreith, Scottish author b. Edinburgh, 8 Jan 1845 He was educated at Oxford, was Conservative member of Pailiament for Wigtownshire, 1880–1906, and president of the Society of Antiquaries of Scotland, 1900–13 Among his many publications are 'Noontide Essays' (1892); 'Scottish Land Names' (1894); 'Rainy Days in a Library' (1896); 'Life of the Duke of Wellington' (1899); 'Memories of the Month's' five series (1900–09); 'The House of Douglas' (1901); 'Memoirs of George Romney' (1902); 'The Creevy Papers' (1903); 'A Century of Empire' (1909–11); 'The Making of Scotland' (1911); 'Flowers, A Garden Notebook' (1923); 'Inter Alia' (1925).

MAXWELL, James Clerk-, Scottish natural philosopher b Edinburgh, 13 Nov. 1831; d. Cambridge, England, 5 Nov. 1879 He was educated at Edinburgh and at Trinity College, Cambridge, and in 1856 was appointed professor of natural philosophy in the Marischal College, Aberdeen, and held that office till its amalgamation with King's College to form the University of Aberdeen in 1860, when he was appointed to a sımılar chair ın King's College, London a similar chair in King's Conege, London in 1857 he obtained the Adams prize at Cambridge for an essay 'On the Stability of Motion of Saturn's Rings' From 1855 to 1872 he published his investigations on 'Perception of Color, and Color Blindness,' which obtained for the Pumford medal and his election as him the Rumford medal and his election as FRS. He resigned his chair in 1865 and in 1871 was elected unopposed to the newlyfounded chair of experimental physics at Cam-He directed the formation of the Cavendish laboratory founded by the Duke of Devonshire and opened in 1874 In 1871 he published his 'Theory of Heat,' which has gone through several editions. In 1873 appeared his great work, 'Electricity and Magnetism.' Maxwell's fame will rest on his being the one who took the first grand step toward the discovery of the true nature of electrical phenomena He rejected the theory of electrical "action at a distance," and sought to explain all electrical and magnetic phenomena as the results of local strains and motions in a medium whose contiguous parts only act on one another by pressure and tension. His scientific papers have been collected by W. D. Niven (1890) Consult Campbell and Garnett, 'James Clerk Maxwell' (London 1882); Glazebrook, R. T., 'James Clerk Maxwell and Modern Physics' (ib. 1896)

MAXWELL, William Henry, Irish-American educator: b. Stewartstown, Tyrone, Ire-

land, 5 March 1852; d 3 May 1920. He was graduated at Galway Queen's College in 1872, and in 1874 received the degree of A.M. In 1874 he came to the United States. After eight years as teacher in Brooklyn he became assistant superintendent of schools in that city in 1882 and superintendent from 1887 to 1898. After 1898 Dr. Maxwell was superintendent of public schools of Greater New York. In this position he often came into conflict with members of the board of education. He advocated a college training for teachers and raised the requirements for teachers' examinations in New York He was president of the National Education Association in 1905. Dr. Maxwell was always very deeply interested in the promotion of the study of English. He published 'Elementary English Grammar'; 'School Grammar' and other educational works.

MAY, Phil, English illustrator: b Leeds, 22 April 1864, d Saint John's Wood, London, 5 Aug 1903 He was son of an engineer; had his schooling in Leeds, was apprenticed there to a lawyer, whom he soon left to join a company of players, for them he designed posters, married at the age of 19; and in 1884 and 1885 began drawing for Society and Saint Stephen's Remew He went out to Sydney, Australia, in 1885, where he gained some same as artist of the Bulletin, and was forced by the exigencies of newspaper illustration to a very scanty use of line and a complete omission of anything else; went to Paris; retuined to his work on Saint Stephen's Review, then began to draw for the Daily Graphic, in 1888 returned to England; thereafter traveling through America; and shortly after Du Maurier's death was taken on the staff of Punch He must rank with Leech, Tenniel and the other great British cailcaturists His art was remarkably simple and telling, his method, it is said, being to reduce an elaborate and detailed drawing to the fewest possible lines He was particularly happy in his portrayals of London street-life, which are full of humor and sympathy; his Parliament sketches are less felicitous and a misapplication of his talent. His own hatchet face, "banged" hair and ever-present cigar figure in many of his sketches From 1892 to his death he published (Phil May's Annual) His other collections of drawings are 'Parson and Painter' (1891); 'Phil May's Sketch Book' (1895) and 'Phil May's Gutter-Smpes' (1896); 'Phil May's Graphic Pictures' (1897).

MAY, Samuel Joseph, American reformer and abolitionist b. Boston, Mass, 12 Sept 1797; d Syracuse, N. Y., 1 July 1871 He was graduated at Harvard in the class of 1817, and after studying theology under Dr Ware at the Harvard Divinity School became a Unitarian clergyman and in 1822 accepted a call to a church at Brooklyn, Conn. He was interested in the anti-slavery cause and preached as well as wrote in favor of it, advocating immediate emancipation, for which he was mobbed and burned in effigy at Syracuse in 1830. He was a member of the first New England Anti-Slavery Society, formed in Boston in 1832, and eagerly championed Prudence Crandall, when she was persecuted and arrested for receiving colored girls into her school at Canterbury, Conn Mr May was also a member of the Philadelphia convention of 1833 which formed the American

Anti-Slavery Society, and was one of the signers of the "Declaration of Sentiments," the signers of the Treathauth of Settlithenis, the author of which was William Lloyd Garrison For 18 years he was the general agent of the Massachusetts Anti-Slavery Society, and as such lectured and traveled extensively He was five times mobbed while on a lecture tour in Vermont, in 1835, once while lecturing in the capitol at Montpelier. He had charge of the Unitarian church at South Scituate, Mass., from 1836 to 1842, becoming in the latter year, at the request of Horace Mann, the principal of the Girls' Normal School at Lexington, Mass In 1845 he became pastor of the Unitarian Society at Syracuse, N. Y., which position he retained until 1868. Mr. May assisted in the rescue of Jerry, the slave, in 1851, and with several others was arrested for this offense against the Fugitive Slave Law May and his associates issued a declaration in which they admitted the fact of their being implicated in the rescue, but claimed that the Fugitive Slave Law was unconstitutional and wicked Realizing the changing sentiment in the North the authorities never brought the case to trial. May's lite, like that of many another Abolittonist, was often in danger. He was among the most conservative anti-slavery leaders in his methods and was prominent also in many educational and charitable enterprises, and did a great deal toward improving the public school system of Syracuse. By his associates May was termed the Saint John Apostle of the Gospel of Freedom, on account of his gentle voice and manner. He was both gentle and firm, courageous, unweared and unselfish in the anti-slavery cause. He published Education of the Faculties' (1846); 'Revival of Education' (1855); 'Recollections of the Anti-Slavery Conflict' (1868). Consult Mulford, 'Memon of Samuel Joseph May' (Boston 1873; new ed., 1882).

MAY, Thomas, English dramatist and historian b. Mayfield, Sussex, 1594; d. London, 13 Nov 1650. He was educated at Cambridge, became a member of Gray's Inn, but never practised, and figured brilliantly at court. He published 'Antigone,' 'Cleopatra,' 'Agrippina' and other dramas and translations of the 'Georgies' and Lucan's 'Pharsalia' He was an intimate of Charles I and at the latter's behest wrote histories of Edward III and Henry II in verse. He espoused the cause of Parliament in the Civil War, was made secretary and historiographer to Parliament and wrote 'Ilistory of the Parliament of England, 1640-43' (1650; several times republished), and a 'Breviary' of the same history (1650). Until the Restoration his body reposed in Westminster Abbey, but as in the case of other Parliamentarians, it was then dishonored and thrown into a neighboring pit.

MAY, Thomas Erskine, BARON FARNBOROUGH, English historian. b. London, 8 Feb
1815; d Westminster, 17 May 1886 He was
educated at Bedford Grammar School, became
assistant librarian to the House of Commons in
1831 and was called to the bar in 1838. He was
appointed examiner of petitions for private bills
in 1846 and clerk to the House of Commons in
1871 He was knighted in 1866, and just prior
to his retirement from office in 1886 was raised
to the peerage. He is best known as an antiquarian and historian. His chief works are 'A

Practical Treatise on the Law, Privileges, Proceedings, and Usages of Parliament' (1844; 10th ed, much enlarged, 1893), a model of its kind, which has been translated into most modern languages, 'Constitutional History of England since the Accession of George III, 1760–1860' (1801–63, republished with supplementary chapter, 1871); 'Democracy in Europe: a History' (1877) In 1854 he collected and reduced to writing the 'Rules, Orders, and Forms of Procedure of the House of Commons'

MAY, the fifth month of the year, having 31 days It was second in the old Alban calendar, third in that of Romulus and fifth in that of Numa Pompilius The etymology of the word is doubtful. It was called Maius by Romulus, in respect to the senators and nobles of his city, who were called Majores, as the month following was called Junius, in honor of the youth of Rome who served him in war and were named Juniares. Some etymologists are of opinion that it was called Maia, from the goddess of that name, the mother of Mercury, to whom they offered sacrifices on the first day of the month. The sun enters Gemini during May and the plants of the earth generally begin to flower. See Calendar.

MAY APPLE. See MANDRAKE

MAY BEETLE, or JUNE BUG, popular names for the clumsy brown beetles of the genus Lachnosterna (family Scarabæidæ) common throughout the United States. The adults fly by night during late spring and often are troublesome upon the young foliage of trees and shrubs. They are attracted by light and may be trapped in this way. The larvæ are large, brown-headed, white-bodiéd grubs which leed upon the roots of grass, etc., passing one or more years in the ground. For this reason strawherries and other crops which they attack should not be planted upon freshly-turned sod land. Late fall plowing is often practised to destroy them

MAY-BIRD, a gunner's name for various shore birds which return from the South in the month of May, especially the knot (qv). In New England the black-bellied plover, and in the South a curlew, are called May-birds or May-cocks.

MAY CHERRY, a local name for the service-herry bush See Amelanchier.

MAY DAY, popular name of the first day of the month of May, on which from a very early period general festivities took place May has generally been regarded as a time for gladness The outbreak into new life and beauty which marks nature instinctively excites. The first emotion is a desire to seize some part of that profusion of flower or blossom which spreads around, to set it up in decorative fashion and to let the pleasure which it excites find expression in dance and song; and among pagans the tendency has been to render to this vegetative trophy a sort of homage Among the Romans, the feeling of the time found vent in their Floralia, or Floral Games, which began on 28 April and lasted to 3 May. Among the old Celtic peoples, a festival called Beltein (Baal's fire) also was held on this day, but it does not seem to have been connected with flowers, but rather with sun-worship In Christian times in the Celtic countries the Church

Christianized this celebration by transferring it to 24 June, the feast of Saint John, which is still celebrated with bonfires In England, as we learn from Chaucer and other writers, it was customary, during the Middle Ages, for all, both high and low — even the court itself — to go on the first May morning at an early hour "to fetch the flowers fresh" Hawthorn branches also were gathered, these were brought home about sunrise, with accompaniments of horn and tabor, and all possible signs of joy and merriment. The people then proceeded to decorate the doors and windows of their houses with the could be a proceeded to the country of the count with the spoils. By a natural transition of "ideas, they gave the hawthorn bloom the name "the May"; they called the ceremony "the bringing home the May"; they spoke of the expedition to the woods as "gorng a-Maying". The fairest maid of the village was crowned with flowers as the "Queen of the May"; placed in a little bower or arbor, where she sat in state, receiving the homage and admiration of the youthful revellers, who danced and sang around her. This custom of having a May queen seems a relic of the old Roman celebration of the day when the goddess Flora was specially wor-shiped. How thoroughly recognized the custom had become in England may be illustrated by the fact that in the reign of Henry VIII the heads of the corporation of London went out into the high grounds of Kent to gather the May—the king and his queen, Catharine of Aragon, coming from their palace of Greenwich, and meeting these respected dignitaries on Shooter's Hill But perhaps the most conspicuous feature of these festive proceedings was the erection in every town and village of a fixed pole—the May-pole—as high as the mast of a vessel of 100 tons, on which, on May morning, they suspended wreaths of flowers, and round which the people danced in rings nearly the whole day. A severe blow was given to these merry and often wild revels, by the Puritans, who, in their campaign of taking the joy out of life, caused May-poles to be up-rooted and a stop put to all their jollities They were, however, revived after the Restoration and long held their ground, but the celebration is now confined to school children, their elders not taking part, so much has our modern industrial feudalism absorbed the leisure time of all but the parasite classes In France, Germany and other countries, May-poles were common and festive sports are even yet observed. The Roman Catholic Church, in order to counteract the evils too often incident to the celebration of May Day, appears to have instituted the feast known in France as La Fête-Dieu, celebrated with processions and flowers. In America May Day celebrations have come into favor in the present century and in nearly all public parks of great cities games and processions are held. In Europe since 1889 May Day has been adopted as the international Labor Day (q.v.).

MAY-FLY, SHAD-FLY, or DAY-FLY, members of the order *Ephemerida*. The species, of which about 300 have been described nearly one-third of which are North American, are fragile insects with large fore-wings, small or wanting hind-wings, short antennæ, atrophied mouth parts and two or three thread-like abdominal filaments. Being greatly attracted to lights, the adults are often a source of annoy-

ance in lakeside and riverside towns, and are sometimes especially troublesome in obscuring the lights from lighthouses The eggs are laid in fresh water either upon the surface or upon the bottom, the female diving for this purpose The larvæ, which feed mainly upon vegetable matter, are active creatures with strong legs, abdominal tracheal gills and anal appendages They live upon the bottom, under stones, covered with mud, or in burrows After moulting about 10 times wing pads appear, and these increase with each moult until the last, which may be number 20 This occurs in the open air, the one previous to which occurs at the surface of the water, the insect escaping from its subimago skin rather suddenly One striking difference the adults exhibit is the development of paired sexual organs, which do not appear in other orders of insects. The larvæ may take three years to develop; the adults live only a few days, lay their eggs and die Both adults and larvæ are important food for fishes, and consequently they form a favorite bait with anglers, and are imitated in making artificial

MAYA, ma' ya", the ruling race of Yucatan at the time of the discovery of America and for many years previous. Where they came from is uncertain, but that they invaded the peninsula from two different directions is asserted in various of their traditions. probably means that the people are of distinct races, one of which came by way of the Gulf of Mexico and the other from the west or southwest by land The first influx of insouthwest by land The first influx of in-habitants to Yucatan recorded in the traditions was led by the great culture hero Zamná (qv) who became the first temporal and ecclesiastical ruler of the land, a sort of Moses, a giver of laws and a solidifier of traditions. Tradition says he lived to be quite old and that he divided the country into districts which he gave to his followers of noble birth. At the time of his death the Mayas were in secure and peaceable possession of the peninsula of Yucatan, throughout the length and breadth of which they had extended their culture. These early Mayas seem to have been closely connected with the other great cultured peoples of Chiapas, Honduras and Guatemala, in language, customs and religious institutions

The second inroad of foreigners into Yucatan was, according to traditions, headed by Quetzalcoatl. This probably means that the newcomers were followers of the Toltec religion and probably possessors of Nahuan culture. Whether, on their arrival in Yucatan, they spoke the same language as the first Mayas is not known; but it seems probable that they did, since they are called, by various early writers, "the Itzas," a name generally conceded to mean the followers of Zamná or Itzamná, the culture god of the early Mayas. Yucatan now had two governing races which seem to have lived on more or less friendly terms with one another, and to have had no trouble in communicating with one another. It is certain that, at the time of the conquest of Yucatan, which took place about 500 years later, only one language existed in the country. Yet the style of the various ruins of Yucatan show that there must have been a blending of cultures and religious ideas, and indicates the

MAYA



Mayan idol Cenan Honduras.

influence of Nahuan civilization in the penunsula. It is probable and there are intimations in the Maya and Quiché traditions, that not only one but numerous nugrations took place over considerable periods of time from the

southwest into Yucatan

Both the original followers of Zamná and the immigrants from the southwest, Chiapas and Guatemala, must have been, as tradition pictures them, great builders for Yucatan is literally covered with ruins whose forms, decorations and peculiar characteristics show that at least two races of considerably different cultures built them. Yet however different may have been the cultures of these two peoples they appear to have become pretty well blended by the time of the conquest, and the two races had merged into one, which the Spaniard named Maya or sometimes Itza. Under the Tutul Xius at Uxmal (q.v) the Mayas built a civilization noted for its splendor among all the neighboring nations Uxmal became the greatest, most powerful, wealthy and artistic city in Yucatan and as such flourished for many years; but it was finally conquered; and Maya power was transferred to Mayapán, which in its turn fell into the hands of people from the mountains near the end of the 13th century. This was followed by a century and a half of civil war in the peninsula, which led finally to the destruction of Mayapán (qv.) about 1460. In this war the Tutul Xus found their power greatly reduced and themselves driven to take refuge in Mani, a city which they still inhabited at the time of the Spanish conquest during the first half of the 16th century. With all these influxes of foreigners who evidently remained in the country, into which they appear to have continued to flood up to the time of the discovery of America, the language of Yucatan remained a unit, in which the dialects were so slightly marked that the people of the whole peninsula conversed with one another without any difficulty. This would seem to indicate that the Maya race was fundamentally the same as that which erected the great historic buildings now in ruins throughout the Quiché country, part of Honduras and the Mexican state of Chiapas. Their culture seems also to have been related to that of Oaxaca, Tabasco, Cam-peche and Guerrero. The territory of the Maya race proper stretched southward covering all the peninsula of Yucatan and reaching to the Pacific Ocean.

The Mayas had made a very great advance in civilization at the time of the discovery of America; though, owing to the long and bloody civil wars through which they had just passed, this civilization had lost much of its splendor. This was completely destroyed during the Spanish conquest, which lasted 16 years. Then many of the Mayas retreated to the hilly country and the deeply-wooded coast-land to the west where they continued to maintain their independence during the 300 years of Spanish rule. Numerous military expeditions were sent against them and it was not until the administration of Porfirio Diaz that they were reduced to comparative quiet, from which they have again more or less freed themselves. The Maya tongue is still spoken by about 300,000 persons, of whom about 100,000 are of mixed descent. See Mexican Mythology and Ethnology,

CHICHEN-ITZÁ. See also bibliography under YUCATÁN.

MAYAGUEZ, ma-ya-gwas', Puerto Rico, a seaport city on the Mayaguez River near the west coast, the capital of Mayaguez department and third city of the island in size, 72 miles southwest of San Juan The city was founded in 1752 and has a modern appearance, with wide streets, public plazas, fine buildings, electric lights and a street railway. A railway brings it into communication with the interior. It has a large but shallow harbor, and its port is three miles distant at Mayaguez Playa, where a considerable export trade in coffee, sugar and oranges is carried on chiefly with the United States. In the vicinity is the Porto Rico Agricultural Experiment Station Pop. municipality (1940) 76,482; (city) 50,371.

MAYAPAN, the ancient capital of the Maya kingdom in Yucatan. According to tradition it was founded by Zamná, the ancient highpriest, ruler and culture deity of the Mayas. Zamuá divided the Maya kingdom among his leaders whose descendants formed the Maya nobility of Yucatan. In later days the Tutul Xiu, high nobles, became the ruling power under the sovereign, who was chosen from among them. Many years later Kukulcán, another traditional demi-god, according to traditional history, became king and high priest of Maya-pán. As this name is a literal translation of the word Quetzalcoatl (q.v), the name of the Nahuatl god of culture, and as the story of the latter and that told of Kukulcan are almost identical, it is probable that this tradition records the conquest of Mayapán by the Toltecs or some Nahuatl race who introduced into Yucatán the worship of Quetzalcoatl. According to the Maya traditional history this Kukulcan formed a confederacy of the rulers of Mayapan and Chichen Itza, the latter the ruling party among the Itzas. Of this confederacy he seems to have been the pontifical head and the ruling spirit, though with him the other two sovereigns were legally joint rulers with equal powers On his departure from Mayapan, which seems to be mythical, Kukulcan left the kingdom to princes known afterward as the Cocomes, under whose seven successive rulers Mayapan enjoyed a period of wonderful pros-perity during which many cities throughout the country subject to this capital are supposed to have been built. The ruins of these ancient cities are still found in the vicinity of Mayapán.

In the meantime, the city of Uxmal (q v) rose to power in another part of the isthmus. In a sanguinary war with this latter Mayapán was finally defeated and destroyed Uxmal became the head of a new confederacy, with the Tutul Xiu the ruling royal family The latter ruled wisely and well at first and rebuilt Mayapán, which continued to flourish for several centuries. It was, however, finally razed to the ground about the middle of the 15th century, or shortly before the discovery of America, in a civil war in which the vassal lords fought against and finally overthrew the power of the Tutul Xiu dynasty Thus finally disappe: red Mayapán, the first of the known great and populous cities of ancient Yucatán The ruins of the city of Mayapán are situated about 25 miles south of Merida The

The ruins of the city of Mayapan are situated about 25 miles south of Merida. The condition of these ruins to-day seems to bear

out the traditional history that this old capital of the Mayas was completely destroyed, for little of its past magnificence now remains standing. But numerous mounds, terraces and pyramids, badly ruined edifices and huge quantities of the standing of the tities of stone, sculptured blocks and foundations of buildings scattered over a considerable extent of territory are evidence of the existence of a great centre of population and a place of some magnificence. One great mound or pyramid over 69 feet high has a stanway 20 feet wide on each of its sides leading from the ground to the truncated summit, a stone-paved platform considerably wider than the stairway Sculptured stone blocks he scattered over an area of three miles, attesting the great extent of this ancient Maya capital which tradition says was once surrounded by a thick and high stone wall, but that this wall was razed to the ground at the time of the final destruction of the city about 100 years before the conquest of Yucatan by the Spaniards Along the line of this wall runs an old ditch, now filled up with débris, and on both sides of this are vast quantities of stone supposed to have once formed part of this ancient rampart. See Uxmal; Chichen Itzá; Yuca-TAN

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JOHN HUBERT CORNYN.

MAYBRICK, Michael ("STEPHEN ADAMS"), English composer b. Liverpool, about 1845; d 26 Aug. 1913 He studied music in Italy and Germany and was for many years a leading baritone vocalist in concerts and English opera. As a writer of songs over the signature "Stephen Adams," he was widely popular in this country and England Among the best known of his many songs are 'The Midshipmite'; 'Nancy Lee'; 'Alsatian Mountains'; 'The Holy City'; 'A Warrior Bold'

MAYENCE, mä-yŏns. See MAINZ

MAYER, Alfred Goldsborough, American zoologist: b Md, 16 April 1868; d. Fla, 24 June 1922 In 1889 he was graduated at the Stevens Institute of Technology and at Harvard in 1897 From 1892 to 1900 he was assistant to Dr Alexander Agassiz and had charge of radiates in the Harvard Museum of Comparative Zoology from 1895 to 1900. In 1900-04 Dr. Mayer was curator of natural sciences and curator-inchief of the Brooklyn Institute Museum; in 1904-05 he was director of the marine laboratory of the Carnegie Institution, Tortugas, Fla., and after 1905 was director of the department of marine biology at the Carnegie

Institution, Washington Dr. Mayer took part in several scientific expeditions in many parts of the world In 1913 he became lecturer in biology at Princeton. His works include 'Medusæ of the World' (3 vols, 1910); and contributions to zoological publications, especially on the insects and meduse and on chemical causes of animal movements, effects of ions upon rate of nerve conduction; studies of coral reefs of Samoa, etc

MAYER, ma'er, Alfred Marshall, American physicist b Baltimore, 13 Nov 1836, d. Maplewood, N J, 13 July 1897 He studied at Saint Mary's College, Baltimore; spent two years in a machine-shop and draughting-room; specialized in chemistry and physics; became professor of these branches in the University of Maryland (1856) and in Westminster College, Fulton, Mo (1859); after two years of study in Paris was appointed to a chair in Pennsylvania College, Gettysburg (1865); went thence to Lehigh University in 1867; and from 1871 to his death was professor of physics in Stevens Institute, Hoboken, N J There he made important researches in acoustics, invented the topophone, an apparatus to detect the phases of sound vibration, discovered five methods of analysis of compound sounds into their elementary tones; and stated the law of tuning-fork vibration. He became a member of the National Academy of Sciences in 1872 He wrote many papers for the American Journal of Science, notably a series entitled 'Researches in Acoustics? and was at one time a member of the editorial staff, several contributions to the Notes on Physics' (1868); 'The Earth a Great Magnet' (1872); 'Light' (1877); and 'Sound' (1878) Consult Science (issue of 20 Aug 1897),

MAYER, Brantz, American author: b. Baltimore, 27 Sept. 1809; d there, 21 March 1879. He was educated at Saint Mary's College, Baltimore, studied law by himself during an Oriental voyage in 1827-28 and then at the University of Maryland; was admitted to the bar in 1829; and after a year in Mexico as secretary of legation wrote Mexico as it Was, and as it Is' (1844) In the same year he founded the Maryland Historical Society In the Civil War he sympathized with the Union was president of the Union State General Committee, and from 1863 to 1871 paymaster in the United States army His best book was 'Cap-United States army Fits best book was 'captain Canot,' a story of the slave trade founded on fact. He wrote also 'Mexico, Azte, Spanish, and Republican' (1851); 'Observations of Mexican History and Archæology' (1856); 'Mexican Antiquities' (1858); 'Memoir of Jared Sparks' (1867); and 'Baltimore as it Was, and as it Is' (1871).

MAYER, Constant, American artist b. Besançon, France, 4 Oct 1832; d. 1901. A student at the School of Fine Arts in Paris, he left his studies in 1857 and settled in New York, where his sketches and portraits won immediate success. His portraits of Grant and Sherman and his life-sized genre paintings, such as 'Maud Müller'; 'The Song of the Shirt'; 'Evangeline,' gained favor From 1866 https://example.com/ 1866 he was an associate of the National Academy of Design and exhibited frequently at the Salon,

artist, brother of Alfred Marshall Mayer (qv.) and nephew of Brantz Mayer (qv.) b Baltimore, 27 Dec. 1827, d 1908. He studied at there under A J. Muller, and under Gleyre and Brion in Paris and then settled in Annapolis. He made a special study of Dakota Indian types; contributed to Harper's and Century various articles with his own illustrations; and exhibited in the Paris Salon and at the Centennial Exhibition of 1876, where he received a medal for two pictures, "The Continentals" and 'Attic Philosopher. Among his other canvases are 'Feast of Mondawmin'; 'The King's Fool'; 'The Trappist'; 'Maryland in 1750'; 'Crowning a Troubadom,' 'The Treaty of Traverse des Sioux,' 'Minnesota' (1886); 'The Washington Cockade,' 'Founders of the Baltimore and Ohio Railroad' (1891; and 'The Bunning of the Peggy Stuart')

MAYER, Henry, American caricaturist: b. Worms, Germany, 18 July 1808. Educated in Germany and England, he at first followed a business career in the latter country, but emigrating to the United States in 1887 soon won for himself a distinct place as caricaturist, by his designs and illustrations for American and Emopean papers. Since 1893 he has resided in New York. His works are 'Autobiography of a Monkey' (1896), 'In Laughland' (1899); 'Fantasies in Ha-Ha' (1899), 'A Trip to Toyland' (1900); 'Adventures of a Japanese Doll' (1901); 'Alphabet of Little People' (1901). He is the creator of 'Impressions of the Passing Show' for 10 years in the New York Times. He received a personal gift of two clossonné vases with imperial crest from the late Mikado for his cartoons during the Russo-Japanese War. He was editor of Puck in 1914 and contributing editor thereafter.

MAYER, mī'er, Julius Robert von, German physicist: b. Heilbronn, Würtemberg, 25 Nov 1814; d. there, 20 March 1878. He was educated at the gymnasium in Heilbronn, studied medicine at Tubingen and finished his university studies at Munich and Paris. In 1840 he went to Java as a ship's surgeon, and while there turned his attention to studies of the blood, extending his work to exhaustive investigations of animal heat, to which he applied the mechanical theory. Returning in 1841 to Heilbronn, where for some years he practised his profession, he became deeply engrossed with his scientific labors, and in 1842 published in Liebig's Annalen der Chemie und Pharmacie a preliminary statement of his revolutionary theory of heat, together with his views on the conservation and correlation of energy. Three years later he restated his results in Die organische Bewegung in ihrem Zusammenhange mit dem Stoffwechsel,' at the same time giving a forecast of his theory of the meteoric origin of the sun's heat Contemporaneously with Mayer the mechanical theory of heat was worked out independently by J. P. Joule (q.v.) in England, and a controversy arose regarding the priority of discovery. The Royal Society gave Mayer the Copley medal in 1871, and two years before his death he was ennobled by the king of Wurtemberg. His collected works appeared in 1867 under the title 'Die Mechanik der Wärme' (3d ed., by J. S. Weyrauch 1893). Consult Weyrauch, 'Robert Mayer' (Stuttgart 1890); id, 'Kleinere Schriften und Briefe von Robert Mayer' (Stuttgart 1893); Gross, 'Robert Mayer and Heimann von Helmholtz' (Berlin 1898); Jeutsch, E., 'Julius Robert Mayer; seine Krankheitgeschichte und die Geschichte seiner Entdeckung' (Berlin 1914).

MAYFAIR, London, England, a fashionable neighborhood in the "West End" adjoining Belgiavia, east of Hyde Park, and bounded by Park lane and Bond street See London.

MAYFIELD, Ky, city and Graves County seat; alt 421 feet, 23m. S. of Paducah; on the Illimois Central Railroad. It is in an agricultural area producing tobacco, cotton and milk, and has manufactures of men's and boys' clothing, and condensed milk. Mayfield is an important national market for dark, fire-cured tobacco. In February, each year, is held a mule market. The city is the shipping point for high grade ball clay which has been mined in this area suice 1891. The town was founded about 1823 and incorporated in 1850. Within a mile of the town is the site of Camp Beauregard, former Confederate recruiting station and assignment base. Pop. (1930) 8,177, (1940) 8,619.

MAYFIELD, Pa., borough in Lackawanna. County; alt 952 feet, 14m. NE of Scranton; on the Delaware and Hudson Railroad. It is a coal mining center; the mines here, first developed prior to 1840, were sold to the Delaware and Hudson Canal Company, in 1874. Pop. (1930) 3,774, (1940) 3,172.

MAYFLOWER, The, the name of the vessel in which the Pilgrim Fathers, or first colonists in New England, sailed to this country in 1620. The Mayflower was a vessel of 180 tons. She set sail from Southampton, England, on 5 Aug 1620, in company with her sister ship, the Speedwell, but the courage of the captain and the crew of the latter vessel failing, both ships put back to port Finally on 6/17 September the Mayflower again spread her sails from Plymouth, having on board as passengers 41 men and their families, 102 persons in all. They succeeded in crossing the Atlantic after a stormy voyage of 63 days They intended to go to the mouth of the Hudson River but the captain of the Mayflower took them to Cape Cod. They landed at Plymouth, Mass, at a point where Plymouth Rock, a huge granite boulder, stands at the water's edge A complete and authentic list of the male passengers who landed from the Mayflower is as follows:

THE MAYFLOWER PASSENGERS.
Alden, John

Allerton, Isaac
Allerton, John
Bradford, Wm.
Brutteraye, Richard
Brown, Peter
Carver, John
Chilton, James
Clarke, Richard
Cook, Francis
Crackston, John
Dotty, Edward
Eaton, Francis
English, Thos.
Fietcher, Moses
Fuller, Edward
Fuller, Samuel
Garduner, Richard
Goodman, John

Hopkins, Stephen
Howland, John
Leister, Edward
Margeson, Edward
Martin, Christopher
Mullins, William
Priest, Degony
Rigdale, John
Rogers, Thomas
Soule, George
Standish, Miles
Tilly, Edward
Tilly, John
Tinker, Thomas
Turner, John
Warren, Richard
White, William
Williams, Thomas
Winslow, Edward
Winslow, Gilbert

With these 41 male passengers and heads of families came 15 male servants, whose names were as follows:

SERVANTS ON THE MAYFLOWER

Carter, Langemore, Sampson, Coper, Latham, Story, Ely, Minter, Thompson, Holbeek, Moore, Trevore, Hooke, Prower, Wilder

The following is a copy of the covenant agreed upon by these first settlers of Massachusetts, signed and subscribed on board the Mayflower at Cape Cod, 10/21 Nov. 1620, two days after the ship came to anchor

THE MAYFLOWER COMPACT

In the name of God Amen! We whose names are underwritten, the loyal subjects of our dread sovereign Lord, King James, by the grace of God, of Great Britain, France and Ireland, King, Defender of the Faith, etc, have undertaken for the glory of God and the advancement of the Christian faith, and honor of our King and Country, a voyage to plant the first colony in the northern parts of Virginia, do by these presents, solemnly and mutually, in the presence of God and of one another covenant and combine ourselves together into a civil body politic for our better ordering and preservation, and furthermore of the ends aforesaid; and by virtue hereof to enact, constitute and frame just and equal laws, ordinances, acts, constitutions, and offices from time to time, as shall be thought most mete and convenient for the general good of the colony, unto which we promise all due submission and obedience. In witness whereof we have hereunto subscribed our names, at Cape Cod, the 11th of November, in the year of the regulation of our sovereign Lord, King James of England, France and Ireland, the Eighteenth, and of Scotland the Fifty-fourth, Anno Domini 1620

Whittier, Lowell, Holmes and other poets have immortalized the *Mayflower* in well-known poems Consult Carpenter, E. J., 'The Mayflower Pilgrims' (New York 1918).

MAYFLOWER. See Arbutus, Trailing.
MAYFLOWER DESCENDANTS, Society of, an American patriotic society composed of individual state societies, the first of which was the New York Society founded 22 Dec. 1894 The general, or national society was founded 12 Jan. 1897 There are now 30 state societies. Membership is confined to those of lineal descent from passengers on the ship Mayflower on her voyage to America in 1620, terminating at what is now Plymouth, Mass. The membership is 5,946.

MAYHEM, in law, the maiming of one person by another, the destroying or disabling of an arm, leg, hand or foot, putting out an eye, etc. Mayhem renders the perpetrator liable to a civil action for damages, and also to a criminal prosecution

MAYHEW, mā'hū, Experience, American missionary: b. Martha's Vineyard, Mass, 27 Jan. 1673; d there, 29 Nov. 1758 He took charge of a half-dozen congregations of Indians, and in 1709 executed for the Society for the Propagation of the Gospel in New England a translation of the Psalms and of the Gospel according to Saint John into the Indian tongue. His principal writing is 'Indian Converts' (1727), containing accounts of 30 Indian ministers and 80 other Indian Christians.

MAYHEW, Henry, English journalist and author: b. London, 25 Nov 1812; d 25 July 1887. In 1831 he started, with Gilbert A'Beckett, a periodical called Figaro in London; in 1841 produced, with A'Beckett, the farce of the 'Wondering Minstrel'; and not long after formed a literary partnership with

his brother Augustus, the "Brothers Mayhew," as they came to be familiarly known, turning out a number of most successful works of amusing fiction. Among these may be mentioned 'The Greatest Plague of Life, or the Adventures of a Lady in Scarch of a Good Scivant' (1847); 'The Image of His Father, or One Boy is More Trouble than a Dozen Gills' (1850), 'Living for Appearances' (1855) In 1851 appeared the first volume of his most important work, 'London Labor and the London Poor'. He was one of the founders of Princh (1841) and its first editor Other works of his are 'The Wonders of Science, or Young Humphry Davy', 'Young Benjamin Franklin'; 'The Boyhood of Mattin Luther'; 'German Life and Manners, as Seen in Saxony at the Present Day', 'The Criminal Prisons of London and Scenes of Prison Life' with Binny His brothers Horace, Thomas and Edward also assisted Henry and Augustus in their enterprises, beside publishing independently.

MAYHEW, Jonathan, American clergyman b Mattha's Vineyard, Mass, 8 Oct 1720; man b Mattha's vineyaid, mass, 8 Oct 1/20; d Boston, 9 July 1766. He was graduated from Harvard in 1744, and from 1747 until his death was minister of the West Church in Boston In a day of theological controversy he was prominent for his tracts. His views were so liberal as to exclude him from the Boston Association of Congregational Ministers He opposed the measures of the British society for the propagation of the Gospel in foreign parts, and got into a dispute about it with Secker, archbishop of Canterbury In both pulpit and press he was an earnest patriot, being of much assistance to Otis and other early leaders By the Tories he was considered to have brought about the Stamp Act riots because of a sermon in which he pleaded for the repeal of the act From him came the suggestion of uniting the colonies in opposition to England Among his writings are 'Seven Sermons' (1749); 'Discourse concerning Unlimited Submission and Non-resistance to the Higher Powers' (1750), and 'Sermons' (1756). Consult the 'Memoir' by Bradford (Boston 1838), Tyler, 'History of American Literature'

MAYHEW, Thomas, American colonial governor. b. England, 1592; d. Martha's Vineyard, Mass, 25 March 1682 Prior to his emigration to New England in 1631 he had been a merchant in Southampton. He settled first at Watertown, Mass, and in 1641 secured from the agent of Loid Stirling a grant of the larger part of the island of Martha's Vineyard and the title of governor With his son Thomas he labored to convert the Indians of the island so successfully that during King Philip's War the island Indians protected the white settlers. He founded Edgartown in 1647, and after the death of his son and grandson continued their ministry and organized an Indian church. Consult Banks, C. E., 'The History of Martha's Vineyard' (Boston 1911).

MAYNARD, mā'nard, Charles Johnson, American naturalist: b West Newton, Mass, 6 May 1845; d. there, 15 Oct. 1929. He went to public school, worked on a farm and studied natural history as a boy. IIe was well known as an ornithologist, discovered the bittern's vocal organs and in 1875 was elected vice-president of the Nutrall Ornithological Club, in connec-

tion with which he founded and edited The Nutall Bulletin As a conchologist he studied the genus Certon of West Indian shells. He also made important additions to the knowledge of American butterflies. Maynard wrote 'Natralists' Guide', 'Butterflies of New England'; 'Buts of Eastern North America', 'Butterflies of New England'; 'Contributions to Science' (3 vols.); 'Bahama Fruit Finch'; 'Manual of North American Butterflies'; 'Sparrows and Finches of New England'; 'Nature Studies' (No. 2, "Sponges"); 'Warblers of New England'; 'Monographi of the Genus Certon'; 'Manual of Taxidermy'; 'Methods in Moss Study'; 'Brids of Eastern Massachusetts'; 'Field Dictionary to the Brids of Eastern North America'; 'Atlas to the Directory of the Birds of Eastern North America'; 'Records of Walks and Talks with Nature' (8 vols.), 'Field Ornithology'; 'Migration of Birds and other Ammals,' and scattering articles in various magazines, etc.

MAYNARD, Edward, American inventor: b Madison, N. J., 20 April 1813; d. Washington, D. C., 4 May 1801. He entered West Point in 1831; resigned because of ill health in 1832; studied denustry and practised in Washington from 1836 to 1890. He invented new dental tools, discovered in 1840 the diversity of the maxillary antra, introduced the method of filling cavities with gold foil, taught dentistry in the Baltimore College of Dental Surgery and in the National University at Washington, and practised successfully in Europe His great fame was due to his invention of small arms and new priming methods which superseded percussion caps. He patented a breech-loading rifle in 1851; a method of converting muzzleloaders to breech-loaders in 1860; a plan to join two barrels so that contraction and expansion in either would be independent of the other, in 1868, and in 1886 a registering device showing the number of cartridges in a magazine rifle. His rifle was adopted by the United States, and brought him decorations from the governments of Belgium, Prussia and Sweden.

MAYNARD, George Willoughby, American artist: b. Washington, D. C., 5 March 1843; d. 5 April 1923. He studied at the New York Academy of Design; later with Van Terms and De Keyser at the Belgian Royal Academy, Antwerp. He had a studio in Paris in 1878, but later located in New York. He was a National Academician and librarian of the National Academy of Design, member of the Society of American Artists, the American Water Color Society and ex-president and honorary member of the Salmagundi Club. Maynard's decorative work may be seen in the Congressional Library, Washington, D. C., the Bijou Theatre, Boston, the ceiling of the Metropolitan Opera House, New York, the Essex County Courthouse, New York, the Essex County Courthouse, New York, Hie principal canvases are 'Vespers at Antwerp'; '1776'; 'Venetian Court'; 'Ancient Mariner' (1883); 'Strange Gods' (1904); 'Old and Rare'; 'Grocks at Ogunquit' (1912); 'Flood Tide' (1912). He is represented in the Metropolitan Museum, New York, the Providence Museum,

the Corcoran Gallery, Washington, and the Pennsylvania Academy.

MAYNARD, Horace, American politician: b. Westboro, Mass, 30 Aug 1815; d. Knoxville, Tenn, 3 May 1882. He was graduated from Amherst College in 1838; and became instructor, and later professor, in East Tennessee College, Knoxville, Tenn He studied law, was admitted to the bar in 1844 and built up a successful practice. In 1857 he was nominated for member of Congress by the Know-Nothing party, and elected. On the outbreak of the Civil War he declared his loyalty to the Union and took an active part in the unsuccessful attempt to keep Tennessee from seceding; on this account he suffered persecution and heavy loss of property during the war. When the Union forces occupied his State in 1864 he was made attorney-general. In 1866–75 he was again member of Congress, being representative-at-large for his State in the last two years. In 1875–80 he was appointed Minister to Turkey, and in 1880 Postmaster-General in President Hayes' Cabinet, holding the office till 4 March 1881.

MAYNARD, Mass, town in Middlesex County; alt. 176 feet; 27m. NW. of Boston, on the Boston and Mame Railroad. It has woolen mills, and a large consumer cooperative enterprise lincorporated in 1871. Pop. (1940) 6,812.

MAYNOOTH, Irish Free State, a market-town of County Kildare, 15 miles west by north of Dublin. Its modern celebrity is derived from the well-known Roman Catholic college of Saint Patrick (q.v.). Maynooth is of historic interest as the scat of the powerful Geraldines, and has ruins of their castle, built 1176 and enlarged in 1426. Several battles with the English occurred here, including the rebellion of Silken Thomas in the reign of Henry VIII, and the war of the Confederates (1641–50). Pop. about 886.

MAYNOOTH COLLEGE. See SAINT PATRICK'S COLLEGE.

MAYO, mā'ō, Amory Dwight, American Unitarian cleigyman and educator: b Warwick, Franklin County, Mass., 31 Jan 1823; d 8 April 1907. He was graduated from Amherst, and taught in the public schools in Massachusetts 1839-44 In 1846 he became the minister of the Universalist Church at Gloucester, Mass, and later held Universalist pastorates at Cleveland, Ohio (1854-56), and at Albany, N Y. (1856-63). He then entered the Unitarian ministry, and was pastor at Cincinnati, Ohio (1863-72), and at Springfield, Mass. (1872-80). He was long prominent as an educator, was an efficient and active member of the boards of education, in Cincinnati and Springfield, and was connected with the Meadville (Pa.) Theological School as lecturer and professor from 1868-98 After 1880 he devoted his attention chiefly to the advancement of education in the South, lecturing frequently in many different States. was the chief editorial writer for the New England and National Journal of Education, and published 'The Moral Argument for Uniand published 'The Moral Argument for Oniversalism'; 'Graces and Powers of the Christian Life' (1852); 'Biography and Collected Writings of Mrs S. C. E Mayo'; 'Symbols of the Capitol, of Civilization in New York' (1859); 'Talks with Teachers' (1885); 'Southern Women in the Peant Education! Movement of the Peant Education! ern Women in the Recent Educational Move468 MAYO

ment in the South' (1892), and 'History of the American Common School.'

MAYO, Charles Horace, American surgeon: b. Rochester, Minn, 19 July 1865; d Chicago, Ill., 26 May 1939. He was educated at the Rochester High School, Northwestern University, and in 1888 was graduated in medicine at the Chicago Medical College. In the same year he entered on the practice of medicine at Rochester, where he afterward resided He received many honorary degrees, among them: A M, Northwestern University, 1902, LL D, University of Maryland, 1909; F.A C.S., American College of Surgeons, 1913, LL.D, Kenyon College, 1916; D Sc, University of Leeds, 1927. Dr. Mayo was surgeon to the Mayo Clinic of Scant Mary's Honoral Bookeaster Maryland to Saint Mary's Hospital, Rochester, Minn; to the Mayo Foundation, University of Minnesota, where he was professor of surgery after 1915 In 1913 he was commissioned first lieutenant in the Medical Reserve Corps, United States Army; was appointed major in 1917, and colonel in the same corps in 1918. In the same year he was made associate chief consultant of the United States Army Medical Department for Surgical Services. He was also consulting surgeon of the Chicago and Northwestein Railway and of the Chicago Great Western Railway. Dr. Mayo was a member of the American Medical Association, of which he was president in 1916-17 and chairman of the section on surgery in 1910; of the American Surgical Association; of the Association of Military Surgeons of the United States; of the Clinical Congress of the American College of Surgeons (president in 1914–15); of the Minnesota State Medical Society, of which he was president in 1905; of the Society of Clinical Surgery; of the Southern Surgical and Gynecological Society, of the Western Surgical and Gynecological Society, of which he was president in 1904-05; of the Council of National Defense Medical Board; of the National Medical Museum; of the Minnesota Pathological Society; of the American Association of Railway Surgeons; of the American Association for the Advancement of Science; etc., etc In 1908-09 he was president of the section on surgery of the International Congress on Tuberculosis. In 1915, with his brother, W. J. Mayo (q.v.), he donated \$1,500,000 to establish the Mayo Foundation for Medical Education and Research at Rochester, in affiliation with the University of Minnesota.

MAYO, Frank, American actor: b. Boston, 19 April 1839; d. 8 June 1896. His first apris April 1839; d. 6 Julie 1890. His first appearance on the stage was at the American Theatre in San Francisco, and he was for several years the leading actor on the Pacific coast. In August 1865 he appeared in Boston as Badger in 'The Streets of New York' with great success, and though he played Shakespearian and other rôles acceptably, notably Othello Hamlet and Ferdinand become both Othello, Hamlet and Ferdinand, became best known in his character of Davy Crockett, first played by him in Rochester, N. Y., in 1872, and thereafter almost exclusively by him till 1884 In later years he played in his own drama of 'Nordeck' and in a stage version of 'Pudd'n-

head Wilson.

MAYO, Henry Thomas, American naval officer: b. Burlington, Vt., 8 Dec. 1856; d. 23 Feb 1937. In 1876 he was graduated at the United States Naval Academy; advanced through various grades to rear-admiral 15 June 1913. In

1915 he was made vice-admiral and in 1917 was promoted admiral. He served on various vessels of the United States Navy, also on both naval and coast survey, was commandant of the Mare Island navy yard in 1911-13; served as aide for personnel at the Navy Department, Washington, in 1913, and on 18 December of that year was made commander of the fourth division of the Atlantic fleet. In 1915 he commanded the battleship squadions of the Atlan-tic fleet and two years later became commander-in-chief of that fleet and hoisted his flag on the Pennsylvania Admiral Mayo demanded an apology from the Mexican commander at Tampico and the firing of a national salute of 21 guins to the United States flag, to make amends for arrest of paymaster and crew of the dispatch boat Dolphin at a wharf while loading gasoline into whaleboat on 9 April 1914 The admiral's action was commended and approved by the government at Washington, and the occupation of Vera Cruz later in the same month was one result of the flag incident. Reverted to rank of rear-admiral 1919. Retried 1920.

MAYO, William James, American surgeon b. Le Sucur, Mum, 29 June 1861, d 28 July 1939 He was a brother of Charles Horace Mayo (q.v.), was educated at Rochester High School and Niles Academy and received his professional training at the University of Michigan, where he was graduated in 1883. Thereafter he practiced in Rochester, Minn, as surgeon to Saint Mary's Hospital. He became first licutenant of the Medical Reserve Corps of the United States army in 1913. With his brother he established the Mayo Foundation for Medical Education and Research at Rochester in 1915. He was regent to the University of Minnesota, was president of the State Medical Society in 1895-96, of the American Medical Association in 1905-06, of the American Surgical Association in 1913-14, and of the Society of Clinical Surgery, 1911-12. He was also a member of the American College of Surgeons, of the Clinical Congress of Surgeons of North America, of the Academie de Medicine de Paris (corresponding secretary), of the Société de Chirurgie de Paris, of the Royal College of England and Scotland He received honors from all the principal universities, among them: MD, University of Michigan, 1883; AM, University of Michigan, 1889; I.L.I., University of Toronto (1906), University of Maryland (1907), University of Pennsylvania (1912); D.Sc, University of Michigan (1908) and Harvard University (1924). He was a Fellow of the Penl versity (1924). He was a Fellow of the Royal College of Surgeons of England from 1913, of Scotland from 1905 and of the American College of Surgeons from 1913. He was widely known for his numerous successful operations in cases of gallstones, cancer and diseases of the intestinal tract.

MAYO, William Starbuck, American novelist: b. Ogdensburg, N. Y., 20 April 1812; d. New York 22 Nov. 1895. His parents had removed to Ogdensburg in the year of his birth. He studied in his native place and in Potsdam Academy and in 1833 was graduated at the College of Physicians and Surgeons, New York. After practising his profession for several years in Ogdensburg he was forced to abandon it owing to ill health. He visited Spain, made a tour in the Barbary States and then took up his residence in New York City, where he gave his entire attention to literature. He is the author of 'Flood and Field, or Tales of Battles on Sea and Land' (1811), 'Kaloolah, or Journeys to the Diebel Kunii,' purporting to be the autobiography of Jonathan Romer and describing his marvelous adventures in Africa (1849); 'The Berber, or the Mountaineer of the Atlas,' similar to the preceding (1850), 'Romance Dust from the Historic Places,' a collection of short tales, founded on historical incidents (1851), 'Never Again,' a novel (1872)

MAYO, mi'ō, a tribe of Mexican Indians of the Piman family, located on the banks of the Mayo River in southern Sonota. Then alies and northern neighbors are the Yaquis and their habits and language, the latter known as Cahita, are almost identical. They are a peaceful, agricultural people and are thoroughly Mexicanized. They number perhaps 6,000

MAYO-SMITH, ma'o smith', Richmond, American political economist. b Troy, Ohio, 9 Feb. 1854, d New York City, 12 Nov 1901. He was graduated from Amherst College in 1875 and studied in Germany for two years at the universities of Berlin and Heidelberg. From 1877 he was connected with Columbia University, first as assistant in history and political science, then as adjunct professor (1878-83) and professor of political economy and social science (1883-1901) He was also one of the faculty of the graduate School of Political Science, established in 1880, and his chief work as teacher was done in this school His specialty was statistics, on which he was a recognized authority. He was an honorary Fellow of the Royal Statistical So-ciety of Great Britain, a member of the International Statistical Institution and of the Ameiican Statistical Association, being vice-president of the latter; he was also a member of the National Academy of Science and of the American Economic Association, of which he was one of the founders. He was editor of the Political Science Quarterly from 1886, and published (Emigration and Immigration) (1890); 'Statistics and Sociology' (1895); and 'Statistics and Economics' (1809)

MAYON, ma-yōn', a volcano of the Philippines situated in the northern part of the province of Albay, Luzon, height, 8,274 feet. It rises from a broad plain about six miles from Albay Gulf and forms a perfect cone; its summit is surrounded by vapor, which at night has a fiery glow. Its sides, almost at the top, are covered with grass or moss, and the ascent, though it has been made, is difficult. Near the summit there are fissures which emit sulphurous gases and steam, and there were several cruptions during the 19th century, the town of Cagsaua at the foot of the mountain being entirely destroyed in 1814. Great quantities of lava and ashes were belched forth in the last eruption (1897).

MAYONNAISE, mā-ŏn-āz', a thick cold dressing for salads, cold meat, poultry, fish, vegetables, etc, made of the yolks of eggs, salad oil and vinegar, with a little salt and pepper; it is sometimes colored red with powdered lobster shell or green with spinach or parsley.

MAYOR. See CITIES, AMERICAN, GOVERNMENT OF, CITY MANAGER PLAN OF GOVERNMENT, EXECUTIVE

MAYOR OF ZALAMEA, The ('El Alcalde de Zalamea). Two Spanish plays bear this title, the first by Lope de Vega (1562–1635), the second, an adaptation, by Calderón de la Barca (1600–81). The superiority of the adaptation over the original is admitted by all critics A comparison of the two works is somewhat unfair to Lope de Vega, because his play is one of his least worthy productions. He reveals, indeed, his characteristic spontaneity, but fails to seize resolutely upon the diamatic possibilities of his story, preferring for some reason to narrate events in their chronological sequence Calderón studies the dramatic situations more carefully and by discarding irrelevancies, reducing the number of personages and sharpening the scatures of those retained, produces a masterpiece. To his predecessor he owes his plot, the dramatic conflict, the principal personages and a few lines which he transfers to his play unaltered. The most striking difference between the two pieces is the character of Isabella, daughter of the mayor (or magistrate) In Lope's play there are two daughters, both flirtations to the last degree So little control has the father over them, that when he is appointed magistrate, he asks pathetically, "How can a father who fails to rule at home, govern a town?" The fate of the daughters at the hands of dissolute soldiers does not surprise the spectator, and the penalty of death imposed upon the seducers hardly seems justified Calderón corrects this defect, and in Isabella, who replaces Leonora and Agnes, he presents a modest young woman, the unhappy victim of a crime which she strives in vain to pievent. Her soliloquy after she has been wronged is pathetic and poignant, and is one of the best passages in the play (Act II, scene i). Among other excellent scenes may be noted the magistrate's farewell to his son, in which shrewd advice and good feeling are happily blended (Act II, scene xxi), and the prolonged struggle between the magistrate and the gouty, blustering, irascible, old soldier, Lope de Figueroa (Act III, scene xv). King Philip II, who appears suddenly at the close of the play, sets his seal of approval upon the action of the father-magistrate in avenging the wrong done to his daughter and thus vindicates the triumph of justice and local autonomy (a precious privilege to Spaniards) over the lawless-ness of undisciplined soldiery The events narrated by the two dramatists are so circumstantial that it is assumed that they are based on a real incident in the march of Philip II into Portugal (1580), when the Tercio de Flandes, a samous regiment commanded by Lope de Figueroa, passed through Zalamea, a small town in Estremadura. Krenkel published both plays with valuable notes in 'Klassische Bühnendichtungen der Spanier' (Vol III, Leipzig 1887). Consult also Menéndez y Pelayo's edition in 'Obras de Lope de Vega' (Vol XII, 1902), and 'Select Plays of Calderón' (ed. Maccoll, London and New York 1888).

MILTON A BUICHANAN MILTON A. BUCHANAN.

MAYORUNA, South American Indiantribe of Panoan stock Their country lies south of the Marañon and between the Ucoyali and Javari rivers, in eastern Peru. They are nomadic, are tall and well formed, go entirely naked and live by hunting. The hair is cut away from the forehead but is allowed to fall down the back. Some have fan skin and beard attributed with some degree of probability to an admixture of white blood through Spanish captives. The tribe is savage and wages constant war with the whites and with other Indian tribes. Spears, clubs and blowpipes are their war weapons. The blowpipe, from which a poisoned dart is thrown a considerable distance, is their most formidable and dangerous weapons.

MAYOTTA, ma-yŏt'tä, or MAYOTTE, ma-yŏt'. See Comoro Islands.

MAYOW, mā'ō, or MAYO, John, English physiologist and chemist, the first to attack the theory of phlogiston: b London, May 1643; d there, October 1679 He was of a Comish family; entered Wadham College, Oxford, in 1658; became a scholar there in 1659; and was elected a Fellow of All Souls in 1660 He was graduated in 1665; studied medicine; practised in Bath; and in 1678 was elected to the Royal Society His Latin tract on the respiration appeared in 1668, it urged that the heart was a mere muscle, that breathing is simply to give the nitroacrian constituent (oxygen) to the blood and that this constituent is necessary to life In 1674 he published 'Tractatus Quinque,' summarizing and completing his theory; in this work he showed that "fire-air," "nitre air" or "aerial spirit," as he styled oxygen, is contained in all acids and is necessary to combustion and respiration, which are therefore analogous. The 'Tractatus Quinque' was republished in 1681 as 'Opera Omnia Medica Physica' In 1684 a Dutch translation appeared; in 1799 a German, and French and English translations in 1840 and 1907, respectively.

MAYOYAOS, ma-yō-yā'ō, a native tribe of the island of Luzon, Philippines, living in the southwestern part of the province of Isabela and in the northwestern angle of the province of Nueva Vizcaya They are a head-hunting tribe of Malay race; and of the Ifugao linguistic stock.

MAYSVILLE, Ky., city and Mason County seat; alt. 448 feet; on the Ohio River, the Chesapeake and Ohio, and the Louisville and Nashville railroads, 69m NE. of Lexington. It has packet and freight service on the river. The surrounding area is agricultural, and Maysville is an important burley tobacco market Its industrial products include motorcycles, shoes, cotton goods, cigars, condensed milk, pulleys and transmission equipment. Maysville is one of the oldest communities in Kentucky, having been settled in the Revolutionary War years, it was incorporated in 1833. The city is named for John May, on whose land it was originally laid out. It has commission government Water, power, and light systems are privately owned. Pop. (1930) 6,557; (1940) 6,572.

MAYWOOD, Calif, city in Los Angeles County; served by the Union Pacific Railroad via motor bus, 5m. SE. of Los Angeles It has no factories; is a residential suburb. The city government is administered by a mayor and council. Pop. (1930) 6,794; (1940) 10,731.

MAYWOOD, Ill, village in Proviso township, in Cook County; alt. 628 feet; on the Des Plaines River; Idm. W of Chicago; on the Chicago Great Western; Chicago and North Western; and Chicago, Aurora and Elgin rairoads. Its industrial products are tin plate, cans tubing, branding mons, beverages, water softeners, and candy. It is the seat of the Chicago Lutheran Theological Seminary. It has a standard public school system, a public library; social, civic and service clubs, and several private charitres. Pop. (1920) 12,072, (1930) 25,829; (1940) 26,648

MAZARIN, Jules, or GIULIO MAZARINI, French cardinal and minister of Louis XIII, Anne of Austria and Louis XIV b Pis-Cina, in the Abruzzt, Italy, 14 July 1602; d Vincennes, 9 March 1661 He came of a Si-cilian family, his father being intendant of Philip Colonna. The first part of his life was spent in reaching out for power and the second part in maintaining that power. Young Mazarin first attempted fortune in a military career. After brilliant studies under the direc-tion of the Jesuits at Rome and afterward at the universities of Alcala and Madrid, he entered the papal nulitary service as captain of infantiy in 1625. His talents, however, lay in diplomacy to which he soon turned and wherein he distinguished himself by his ability. He was rewarded for his services by being made vice-legate to Avignon, in 1034, and as nuncio at Paris, in 1634-36. At Paris he gained the favor of Richelieu, who persuaded him to enter the service of France, which he did in 1640 He became a naturalized citizen of France; was made a cardinal (although not a priest) in recognition of his diplomatic services in Sayov; and in 1642 was designated by Richelieu as his successor. On the death of Louis XIII the queen, Anne of Austria, became regent for her young son, Louis XIV, and it was thought that Mazarin would be dismissed, but instead he gained over the queen-regent, to whom he became bound by mutual ties of affection, and perhaps by a secret marriage. By her he was confirmed in the office of Prime Minister, in May 1643, and this office he continued to occupy, with the exception of two brief periods of exile, until his death. His activities were first directed toward the Cabale des Importants, which he soon suppressed, and to the prosecution of the Thirty Years' War. The war was carried on with success due mostly to the soldierly qualities and ability of Turenne and Condé. The victories of Rocroi, Fribourg, Nordlingen and Lens and the revolt at Naples forced the German emperor to terms and obliged him to cede Alsace to France by the Treaty of Westphalia, in 1648 While prose-cuting these enterprises abroad, Mazarin had unfortunately neglected home affairs and financial embarrassments resulted in a general revolt and civil war known to history as the Fronde. The Parliament of Paris denounced the increasing taxation, while the nobility dreaded the su-premacy of Mazarin. As the immediate result of the conflict Mazarin quitted Paris with the court and took up his residence at Saint-Germain, in January 1649. In April he concluded an amnesty with the Parliament, but further opposition developed from the younger members of the aristocracy (petits-maîtres) and in particular from Condé, who had hitherto remained faithful to the royal authority. With the support of the parliamentarians, Mazarin was enabled to put down the bronde des princes. imprisoned Condé at Vincennes and crushed the revolt of the latter's friends at Rethel and Guyenne, in 1650 Mazann's ingratitude to his late allies, the parliamentarians, caused all his adversaries to unite against him and in February 1651 he was obliged to go into exile near Cologne His activity, however, was nowise at an end. He continued to direct the policy of Anne of Austria from his exile and, in September, rejoined the court at Poiticis, and soon afterward was about to enter Paris with it when he saw that his presence was an obstacle to the young king's entry to the capital. He again went into exile, in October 1652, but returned to Paris on 13 Feb. 1653, and through means of intrigue formed a powerful royal party in the state, gained General Turenne to his cause and returned to his position at court.

Untroubled now with troubles from within, Mazaun set about winding up the war with Spain. The outcome of this conflict remained in doubt until 1655, when French victory bein doubt until 1055, which riving with Cromcame assured through the alliance with Cromcame assured through the Buolish soldiers. The well and the help of English soldiers. The Spaniards, beaten at the Dunes, at Dunkuk, threatened in the Netherlands and menaced at threatened in the Netherlands and menaced at home by the capture of Barcelona, were obliged to sue for peace. By the Treaty of the Pyrénées (1658) the Spannards lost to France, Roussillon, Artors and parts of the duchy of Luxembourg and of Hamaut. Not satisfied with this splendid result, Mazarin formed, in 1658, the League of the Rhine against Austria and directed the succession to the throng of and diverted the succession to the throne of Spain by bringing about the marriage of Louis XIV with the Infanta Maria Theresa. With the completion of these projects his career ended. Mazarin was very avaricrous, and through every kind of financial dealing amassed the huge fortune of over 50,000,000 livies. To the Royal Library he bequeathed his magnificent collection of books. He founded the Collège de Quatre-Nations, later known by his name as the Collège Mazaiin. He has been blamed for the favors shown his family and the project, once entertained by him, of marrying his niece, Maria Mancini, to Louis XIV. These, however, are but the smaller side of a great character. They cannot make one forget the great political genius who extended the territory of France from the Pyrénées to the Rhine and which extricated her from a danger-ous internal crisis. Consult Chéruel, 'Lettres du cardinal Mazarin pendant son ministère' (in 'Collection de documents inédits sur l'his-toire de France,' Paris 1872-94); id., 'Histoire de France pendant la minorité de Louis XIV' (1879-80); id., 'Histoire de France sous le ministère de Mazarin' (1883); Chantelauze, 'Portraits historiques' (1886); Cousin, V., 'La jeunesse de Mazarin' (1865); Hassell, A., 'Mazarin' (1903); Perkins, J. B., 'France under Mazarin' (New York 1915) Mazarin' (New York 1915).

MAZARRÓN, Spain, town, in the provmee of Murcia, 18 miles west of Cartagena and about three miles from the Mediterranean coast, with which it is connected by rail. It has flouring mills, soap works and metallurgic factories, and there are copper, iron and lead mines in the nearby mountains. A custom-

house, barracks, lighthouse and lead works are situated on the coast. The town has a large trade in coal, lead and other ores. Pop. 18,000

MAZATLAN, ma-sat-lan', Mexico, a town and scaport of Sinaloa, about 183 miles southeast of the city of Sinaloa, at the entrance to the Gulf of California, on the Mexican Southern Pacific Railroad. It is built on a hilly crest and has a pleasing appearance. It has a municipal gas system and a street railway. Mazatlan is the chief Pacific port of Mexico and the outlet for the products of the mining district of Saint Sebastian; it has a considerable import and export trade. Silver, copper, lead, pearls and hides are exported. In 1914 the town was besieged by the Constitutionalists and taken after many months. A wireless station has been erected here. In normal times the exports amount annually to about \$4,250,000 and the imports to \$2,500,000.

MAZDAK, maz'dak, Persian religious leader: b Persepolis, about 470 AD; d Nahrvan, between 530 and 540. He was a chief priest at Nishapur, and in 500 proclaimed himself a prophet. He preached the equality of man, the abolition of property rights and free love, abstinence from animal foods and the simple life generally. He converted King Kobad to his views, which forthwith became law, but a rising of the nobles ousted Kobad for three years, and on his return he abjured Mazdak and his doctrine. Khosru Nashirvan put him to death. Consult Browne, E. G., 'Literary History of Persia' (London 1909)

MAZE, Hippolyte, e-pō-lēt maz, French historian: b Arras, 5 Nov 1839; d Paris, 25 Oct. 1891. He studied at the Ecole Normale Supérieure; taught there and at the Lycée Fontanes; was elected prefect of Landes in 1870, deputy in 1879 and 1881 and senator in 1886. He wrote 'The Republic of the United States: Its Foundation' (1869), 'The End of the Revolution' (1872); 'Hoche in Vendéc' (1882); 'The Struggle against Want' (1883); 'General Marccau' (1889), and 'The Generals of the Republic' (1889).

MAZEPPA, ma-zep'a, Ivan Stepanovitch, or John, hetman of the Cossacks: b. Podolia, about 1645; d. Bender, Bessarahia, 1710 He was page to John Casimir, king of Poland, who was a pation of the arts and of literature, and he had therefore an opportunity of acquiring various useful accomplishments A Polish nobleman having surprised Mazeppa with his wife bound him naked upon his own horse and committed him to his fate The hoise carried him to his own residence. Shame made him flee to the Ukraine and join the Cossacks, whose warlike roving life suited his disposition. He made himself conspicuous by his dexterity, bodily strength and courage His knowledge and sagacity procured him the post of secretary to the hetman Samilovitch, and in 1689 he overthrew Samilovitch and himself became hetman. He gained the confidence of Peter the Great, who loaded him with honors and he was finally made Prince of the Ukraine In 1706 he opened negotiations with Charles XII (q.v.) of Sweden for the purpose of freeing himself from Russian dominion, but his treachery was finally revealed to Peter, and he was obliged openly to declare for Charles. After the defeat of Pultowa in 1709 Mazeppa

fled to Bender Peter tried to have the sultan extradite him, but failed despite an offer of 300,000 ducats for the favor Lord Byion has made Mazeppa the hero of a poem (1818) and Liszt of a symphony

MAZURKA, a lively Polish national dance, popular also in the United States. The movements are of a grotesque character. The term is also applied to the music which accompanies the dance, sometimes in thice-eighths time, but for the most part in three-fourths. The mazurka is danced by four or eight couples. Augustus III brought the mazurka to Germany, whence it was learned by the French and finally about the middle of the 19th century it acquired considerable popularity in England. The music of the dance has taken its modern form from Chopin

MAZZINI, Giuseppe, Italian patriot. b Genoa, 22 June 1805, d Pisa, 10 March 1872 He studied law at the University of Genoa and practised his profession for a time, but the strong Liberal opinions he had imbibed as a child and his conviction that the oppressed condition of his country under Austrian rule called for men of action and public spirit, and that a noble course lay open before anyone who would give himself up, heart and soul, to the work of reforming her, led him to devote himself to a political career. In his ardent aspira-tions for the national unity of Italy, it seemed to him that her deliverance from foreign tyranny was to be achieved only by a return to the republican glories of ancient times His patriotic enthusiasm in this direction was fostered by his early studies, which developed in him a passionate idea of the glories of a republic, and by the success which he had achieved in literature while still little more than a youth In 1827 appeared his maiden essay, 'Dell' Amor Patrio di Dante, which was published in a Liberal journal, the Subalpino This led him Liberal journal, the Subalpino This led him to contribute under the mask of literary cuitiques other historical, philosophical and critical papers to the Antologia of Florence and the Indicatore Genovese But the authorities, per-ceiving that the periodical literature of Italy was becoming far too strongly tainted with advanced Liberal opinions, suppressed these journals, and hoped, no doubt, thereby to have silenced their writers also. About 1830 Mazzini became an active member of the Carbonari, and this affiliation was the introductory step to his subsequent political life; he was active, able, bold and impetuous, and he soon rose into a position which gave him great influence in the councils of that secret society While on a mission for the society he was betrayed by a Piedmontese spy, arrested and detained for six months as a prisoner in the fortress of Savona. On his release he went to Marseilles, France, to escape the police surveillance imposed on him in Italy Here he organized the society of La Giovine Italia (Young Italy), and established under that same title a journal to advo-cate his views; the purpose of the society wa, to liberate Italy and establish a national government, Mazzini desiring a republic It was about this time, too, that he addressed to Charles Albert of Sardinia the celebrated letter which drew down on him a sentence of perpetual banishment from his native country. He took active part in the organization of an

insurrection of which Genoa was to be the centre, but the plot was discovered and failed For his share in it Mazzini was sentenced to death in the Saidinian courts. He then went to Switzerland, where he organized another conspiracy for the invasion of Savoy (1834), which also failed In 1837 he quitted Switzerland and took up his abode in London, where he kept in correspondence with the revolutionary leaders on the Continent, was recognized as the head of the Young Italy party, and instigated several insurrections, which were unsuccessful After the insurrection in Milan in 1848 he again went to Italy, was chosen a member of the Tuscan provisional government in February 1849, and in the following month, when Rome was proclaimed a republic, he was chosen first of the triumvirs. He was the main-spring of the defense of Rome against the French, and on the surrender of that city in June Mazzini escaped to Lausanne, Switzerland At this time he addressed to M de Tocqueville and other French statesmen some most bitter and reproachful letters on the highhanded policy pursued by France Finding his continental residence too hot for him he returned to London, not, however, with any idea of abandoning his long-cherished hopes for Italian unity. Later he had a hand in the unsuccessful uprisings at Mantia (1852), in Milan (1853) and in Predmont (1857), being in Italy for a short time in 1857. He assisted also in organizing the expeditions led by Garibaldi m 1860, 1862 and 1867. An aident Republican, he refused to take his seat in the Italian Parliament under the monarchy, though repeatedly elected from Messma, as a protest against the uncanceled sentence of death against him In 1866 this sentence was formally rescinded; in 1868 he suffered from a serious illness, the effects of which left him in impaired health. In 1870 he was arrested at Gaeta under charge of conspiracy with Garibaldi and imprisoned for two mouths, being released after the occupation of Rome by the Italians. He was accorded a public funeral by the Italian govern-

Mazzini was a copious writer. A perfect master not only of Italian, but of French and of English literature, he was an able commentator of Dante, the author of works on philosophy and a constant contributor to some of the most delightful periodical literature in Paris and in London. He would turn from the warfare of politics to write in his Apotolato Popolari for the benefit of Italian workmen sermons. On the Duties of Man. He analyzed in masterly fashion the faults and shortcomings of the economic and socialist schools. Though his actions were sometimes politically indiscreet, he was a man of attractive character and strong personal magnetism, distinguished throughout his career for disinterested patriotism and the highest moral standards of conduct. He was interested in the labor movement, organized a workingmen's association in London in 1840 and was for a time connected with the International Workingmen's Association (qv), but withdrew from that society when it declared for Socialism. During his later life especially his efforts were directed toward separating republicanism from both Socialism and atheism. No man won so many admirers as Mazzini and yet secured so

There was hardly a human few friends being whom long tamiliarity had not estranged from Mazzini. With manners consummately affable and courteous he combined an overweening conceit and a narrowness and bigotiv of view which hardly tolerated independent minds. He was a lonely genius, all apart from the common ways of other mortals, spurning the suggestions of the plannest common sense, professing to do all for his fellow-beings, yet nothing with them or by their aid. He gave up the idea of ever being a prophet in his own country in his own age, his only trust was in a coming generation, where the germ of his idea could alone attain full development. The best edition of his works is 'Scritti Editi ed Inediti' (18 vols, Milan 1861 91), a partial collection is published under the title Lite and Writings of Joseph Mazzini, (1891) His letters have been published in English (6 vols., London 1890 91) Consult Memon of Joseph Mazzini (1877). Consult 'Memori of Joseph Mazzini' (1877), containing his two essays 'Thoughts on Democracy in Europe,' and 'On the Duties of Mazzini' (1892), Marriott, 'Makers of Modern Italy' (1889); MacCunn, J., 'Six Radical Thinkers' (London 1907); Holland, R. S., 'Builders of United Italy' (New York 1908); 'Cambridge Modern History' (Vol. XI, ib., 1909); King, Bolton, 'Late of Mazzini' (new ed., ib. 1912); King, H. E. B., 'Letters and Recollections of Mazzini' (London 1912); Thaver 'The Dawn of Italian Independence Thayer, 'The Dawn of Italian Independence' (1893); Martinengo Cesaresco, 'Italian Chaiacte1 s

MAZZOLA, mat-so'la, or MAZZUOLI, mat-soo-ō'la, Francesco, Italian painter, known from his birthplace as It. Parmigiano: b. Parma, 11 Jan 1503; d Casalmaggeore, 24 Aug 1540 His father and two uncles were painters, and to them and to Correggio, who was in Parma in 1521, he owed his earlier training Correggio's manner he caught so well that his Cupid Fashioning a Bow was long and generally attributed to Correggio When 20 he went to Rome and there imitated Raphael and Michelangelo In 1527, upon the capture of Rome by Charles V, his losses were great and he had to escape from the city. He returned to Parma, lost his health, was imprisoned by the city authorities for failure to complete a commission which had been paid for in advance, and upon his release fled to Casalmaggiore, failing to live up to his promise to remade of the 'Madonna with St Margaret,' in the Bologna Gallery; 'Madonna del Collo Lungo,' Pitt Palace, Florence; 'Annunciation,' Ambrosian Library, Milan; various portraits in the Naples Margaret, which will be made of the 'Madonna with St Margaret,' in the Bologna Gallery; 'Madonna del Collo Lungo,' Pitt Palace, Florence; 'Annunciation,' Ambrosian Library, Milan; various portraits in the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Margaret capacity and the Naples Capacity and the Naples Margaret capacity and the Naples Capacity and the Nap traits in the Naples Museum; several sacred subjects, notably 'Madonne' in the Dresden Gallery and in the Louvre; and the great frescoes in the church of Saint John, Parma. More important, though less well known, are Mazzola's etchings, since he introduced etching into Italy. His drawing is correct, and his work bold, fiery and graceful

MAZZONI, Guido, gwë'dō mat-so'ne, Italian scholar and poet: b. Florence, 12 June 1859. He was educated at Florence, Leghorn and Bologna, in 1881 became instructor in Italian literature in secondary schools and in

1887 professor of Italian literature at Padua After 1894 he was professor of the Italian language and literature at the Institute of Florence Ilis poetic work has been to some extent influenced by his familiarity with English literature and largely by his countryman Carducer Besides contributions to reviews, he wrote 'Epigramm di Meleagro da Cadora' (1880); 'In Biblioteca' (1882), 'Esperimenti metrici' (1882), 'Un Ritratto di Gesü' (1887); 'Rassegne litteratie' (1887); 'Fra Libri et Carte' (1887), and other works, including a scholarly history of Italian literature in the last century

MEAD, Edwin Doak, American author and lecturer: b Chesterfield, N. H, 29 Sept 1840 His early life was spent on his father's faim, and in 1866 he entered the publishing house of Ticknor and Fields, Boston. He studied in English and German universities 1875-79, and afterward engaged in lecturing and writing In 1889 he was associate editor of the New England Magazine with Edward Everett Hale, the chief editor, 1890-1901 He was connected with numerous historical and social clubs. For 25 years he was director of The Old South Historical Works; edited 200 Old South leaflets widely used in schools and colleges, and annually arranged courses of lectures. For several years he was president of the Massachusetts Good Citizenship Association and Free Religious Association, and for 10 years president of the Twentieth Century Club. He labored very earnestly in the cause of international peace. He was a trustee of the Church Peace Union, endowed by Mr. Carnegie, and was delegate to international peace congresses at Glasgow, Rouen, Lucerne, Munich and London. He published 'The Philosophy of Carlyle' (1881); 'Martin Luther: A Study of the Reformation' (1884); 'A More Beautiful Public Life'; 'Organize the World'; 'The Principles of the Founders'; 'The Influence of Emerson,' D. 17 Aug. 1937.

MEAD, Larkin Goldsmith, American sculptor b Chesterfield, N. H, 3 Jan 1835; d. 15 Oct 1910 He was educated in the public schools and studded art in Italy, where in Venice he was a member of the United States consulate. His first work was an ideal figure, 'The Recording Angel,' executed in 1855 He served for a time in the Civil War as illustrator for Harper's Weekly, and after the war his work as a sculptor gave him national prominence. The statue of Lincoln on the monument at Springfield, Ill, is his work, as are the bronze statues of Ethan Allen at the Capitol at Washington and in Montpelier, Vt. The latter city has also his heroic figure 'Vermont' on the State Capitol. He also executed the soldiers' monument at Saint Johnsbury, Vt; the Stanford family group for Stanford University; 'The Mississippi River,' Minneapolis; portraits of W. D. Howells, John Hay and Henry James His work includes many ideal pieces: 'The Returned Soldier'; 'The Return of Proserpine from the Realm of Pluto' (exhibited at the World's Columbian Exposition), etc.

MEAD, William Rutherford, American architect: b. Brattleboro, Vt., 20 Aug. 1846 He was graduated from Amherst College in 1867, studied architecture in New York under Rus-

sell Sturgis and in Europe, and upon his return to the United States became a member of the prominent New York firm of McKim, Mead and White, which has had charge of many of the most important public and private buildings in the country. In 1902 he was made a Fellow of the American Institute of Architects, and was a member of the American Academy of Arts and Letters and president of the American Academy, Rome In 1910 he was chosen member of the National Academy of Design and was awarded a gold medal of honor by the National Institute of Arts and Letters He died in Paris, France, 20 June 1928.

MEAD, or METH, a vinous liquor, used in northern Europe and made of honey and water by means of digestion and fermentation. It also receives an addition of fruit, spices and simples to give it a richer flavor. When new, mead has always a strong taste of honey, but this diminishes as it becomes older. Mead is mixed with the must of apples or with wine, beer and even vinegar, and then takes the name of wine-mead, beer-mead, etc. It is one of the oldest of beverages, being known all over Europe within historic times.

MEADE, George Gordon, American soldier b. Cadiz, Spain, 31 Dec. 1815; d Philadelphia, 6 Nov 1872 In 1835 he was graduated from the United States Military Academy and assigned to the 3d Artillery, in 1835–36 served in the Seminore the army and in 1836. Oct. 1836 resigned from the army, and in 1836-37 was assistant engineer in the construction of the Alabama, Florida and Georgia Railway. He was later employed in various works of engineering, including surveys of the mouths of the Mississippi and of the northeast boundary between the United States and British North America. On 19 May 1842 re-entered the army as second lieutenant of topographical engineers He joined Scott's staff at Corpus Christi, Tex, 14 Sept. 1845, and during the Mexican War participated in the battles of Palo Alto, Monterey, Resaca de la Palma and the siege of Vera Cruz. After the war he was occupied in light-house construction and in the geodetic survey of the Great Lakes (1857-61) He became captain in the corps of engineers in 1856. On 31 Aug. 1861 he was commissioner brigadiergeneral of volunteers and assigned to the command of the 2d brigade of the Pennsylvania reserve corps of the Army of the Potomac, stationed on the right of the lines before Washington. He served in the Virginia peninsula campaign and took part in the actions at Mechanicsville (26 June), Gaines' Mill (27 June) and Frayser's Farm (30 June). On 18 June he was promoted major of engineers At Manassas (second Bull Run) he commanded the 1st brigade of Reynold's division, and later he took a distinguished part at South Mountain (14 September) and Antietam (17 September). In the latter battle, when Hooker was wounded, he was placed in command of the First Corps. For his services he was promoted major-general of volunteers 29 Nov. 1862; and at Fredericksburg (13 December) commanded the 3d division of the First Corps, with which he broke through Lee's right and penetrated to the position occupied by the Confederate reserves, but for want of support was compelled to fall back. At Chancellorsville

(2-4 May 1863) he commanded the Fifth Corps. On 28 June 1863 he was appointed commander of the Army of the Potomac, to succeed Hooker Ilis command was then scattered, and on the march through Pennsylvama in pursuit of the Confederate invaders Meade had everything yet to learn of both his own force and the enemy. At Gettysburg on 1-3 July he won the great and decisive battle with which his name is generally associated. (See Geriysburg, Battle or) He received the thanks of Congress and was made brigadiergeneral, United States army, 3 July 1863. During the remainder of the war he commanded the Army of the Potomac with conspicuous ability, and on 18 Aug 1864 became majorgeneral in the regular army. From 1 July 1865 until his death he was commander of the military division of the Atlantic, with the excep-tion of the period January 1868-March 1869, when he was in command successively of the Third Military District and the Department of the South. He was a Fellow of the American Academy of Arts and Sciences. A residence was purchased for him by the citizens of Philadelphia, and after his death \$100,000 were collected and given to his heirs. There is an equestrian statue of him by Calden in Fairmount Park, Philadelphia, and one by Bush-Brown on the field of Gettysburg. Consult Bache, R. M., 'Life of General G. G. Meade' (Philadelphia 1897); Pennypacker, I. R., 'General Meade' (New York 1901).

MEADE, Richard Kidder, American soldier b Nansemond County, Va., 14 July 1746; d. Frederic, now Clarke, County, after 1800. He was educated in England at Harrow and in private schools. He had returned from England some years before the outbreak of the Revolution, and in 1775 entered the service of the struggling colonics, and distinguished himself in his first battle, that of Great Ridge. Recognition came speedily with an appointment to the staff of General Washington, with whom he remained until the close of the war The supervision of the execution of Major André fell to his lot, a duty which while recognizing the necessity for it, he performed with deep regret. At the conclusion of the war he returned to Virginia to engage in the quiet life of the plantation.

MEADE, Richard Worsam, American naval officer: b. New York, 9 Oct. 1837; d. Washington, D. C., 4 May 1897. He was a nephew of Gen. G. Meade (q.v.). He entered the navy as midshipman 2 Oct. 1850. His promotions were lieutenant, 23 Jan 1858; lieutenant-commander, 16 July 1862; commander, 20 Sept. 1868, captain, 13 March 1880; commodore, 5 May 1892, and rear-admiral, 7 Sept. 1894. On 20 May 1895 he was retired from the service. In 1862-63 as commander of a division he cooperated with the land forces of Sherman in subduing the Confederates on the Mississippi. In 1863 he was in command of the marines during the Draft Riots in New York. For a time he was in charge of a department at the naval academy; in 1868 was sent to Alaska and in 1871-73 commanded the Narragansett on the Pacific station. In 1894 he was placed in command of the North Atlantic squadron. He was avayal representative of the United States at the World's Columbian Exposition, Chicago,

1893. He published 'A Treatise on Naval Architecture and Ship-building' (1869)

MEADE, William, American Protestant Episcopal bishop. b near Millwood, Va, 11 Nov. 1789; d Richmond, Va, 14 March 1862 He was a son of R K Meade (qv), and was graduated from Princeton College in 1808, studied theology and took orders in the Episcopal ministry in 1811. His first charge was his home parish, which he served gratuitously. his none parish, which has been all the findings, and in 1829 he was elected assistant to Bishop Moore He was in charge of Christ Church in Norfolk, Va, in 1834–36, and in 1841 succeeded Bishop Moore as head of the diocese He was one of the founders in of Viiginia 1847 of the Evangelical Knowledge Society, He tried to keep Virginia in the Union in 1861, but later entered into the spirit and aims of the Confederacy lle was the author of or the Confederacy The was the author of several works, among which are 'Family Prayers' (1834), 'Reasons for Loving the Episcopal Church' (1852); 'Old Churches, Ministers and Families of Virginia' (1857); 'The Bible and the Classics' (1861). Consult the memoir by his coadjutor, John Johns (Baltimore 1867).

MEADOW, Making and Care of. Meadows may be divided into general groups which will depend upon location, duration and purpose, and their treatment will vary with each of these factors. Meadows located upon low ground, which may be mundated, or which is constantly moist, usually consist of grasses and other plants which do not thrive so well upon upland fields Because of their dampness they cannot be treated like dry soils and they are therefore more frequently permanent than temporary. Further, they are generally better adapted for haying than for grazing, because the grasses that naturally grow upon them are ranker, taller growing species and generally have grown to a considerable height before the land becomes dry enough to turn stock upon it. Except as to season the preparation of lowland meadows is not necessarily different from that

For best results the land should be deeply plowed as early in the season as soil conditions

of upland.

will permit, and harrowed at intervals of 10 days and after each rain that forms a crust until late summer. The practice will not only destroy weeds and weed seeds, but ensure the quick germination of grass seed sown even in dry weather, the soil being moist close to the surface. The soil may be anything, but preferably not sand or clay. If mucky, as in a reclaimed swamp, rolling is frequently advisable, otherwise generally not. Prior to plowing liberal applications of good manure or com-mercial fertilizers should be made and light annual dressings should also be given, preferably in autumn or early spring. Temporary pastures which are intended to last only three or four years should constitute part of a general rotation scheme (see Rotation of Crops) and should be followed by some crop such as corn or potatoes, which can best utilize their products of decomposition. Permanent meadows should be inspected each spring and the spots which appear to be failing given special attention, such as fertilizing, liming, seeding, etc., to maintain a general good average. When the annual yield of hay falls below two tons the

meadow may be considered unprofitable and

should be plowed up and given a change of crop for three or four years.

In general, timothy or "herd's-grass" is the most popular grass in America, because it is hardy, long-lived, large, easily cured and its seed inexpensive and likely to be free from weed seed Orchard grass, tall meadow fescue, red-top, rye-grass and cat-grass are also often used, but are secondary. Blue-grass, which generally appears as a volunteer grass in permanent meadows, is rarely profitable as a hay grass, but is unequaled in the north as a pasture grass. These grasses may all be sown with a sparsely planted cereal which acts as a "nurse crop" But this practice is generally considered inexpedient. The admixture of clover, however, is generally highly desirable, since the clovers supply nitrogenous food to the grasses. Alsike clover is considered best for mixing with timothy since it is somewhat later in ripening than the other large clovers, which mature before the timothy can be profitably cut. Consult Wing, Joseph E., 'Meadows and Pastures' (Chicago 1911).

MEADOW-BEAUTY. See DEER-GRASS. FESCUE, MEADOW fescue-grass a (Festuca). See Grasses in the United

MEADOW-GRASS. See Blue-Grass MEADOW-HEN, the American coot. See

MEADOW-LARK, or MEDLARK, a beautiful American starling (Sturnella magna), numerous in eastern United States as far west as the high central plains, where it is replaced by a variety (S. neglecta) remarkably different in song and some habits. It is about 11 inches long and tail five inches. The body is thick and stout, the legs large, the bill long and straight and the flight powerful. The upper parts are brown, marked with brownish-white, and the exposed portions of the wings and tail with transverse dark-brown bars; the under parts yellow, with a black crescent upon the breast, which is very distinctive as well as a handsome ornament. These birds receive their popular name "lark" from their terrestrial habits and way of singing in the air, uttering a loud sweet double call while circling upon fluttering wings above the meadow or grain-field where the nest is carefully concealed among the roots of the grasses The eggs are white, profusely speckled with light red The western variety has a longer, more vivacious and tuneful song than the eastern bird, and is justly accounted the finest songster of the open regions of the interior. These birds are migratory in the northern parts of their range, but most of them remain during the winter in tha middle parts of the United States and southward, and in the autumn are often shot for market, although in most States such shooting is now prohibited by law. In the Southern States it is commonly called "old-field lark"
The meadow-lark subsists both on insects and on seeds In winter they often form groups, but in the fine seasons seldom more than two are seen together Consult Coues, 'Birds of the Northwest' (Washington 1874).

MEADOW-MOUSE. See FIELD-MICE.

MEADOW-PINK, or MEADOW-CAM-PION, the common cuckoo-flower (q v), or ragged robin (Lychnus flos-cuculi). See Lychnis

MEADOW-RUE, a plant of the crowfoot family and of the genus Thalictrum. These rues are erect perennial herbs, with much divided leaves and small flowers, usually in loose panicles. The genus contains about 75 species, scattered about the north temperate zone, of which the United States and Canada possess about 15 species. The early meadow-rue (T dioicum) is a slender, leafy species, of rocky woods, a foot or two in height, whose flowers, purplish and greenish with yellowish anthers, appear in April or May. The purple meadow-rue (T. dasycarpum), common in New England woods, is distinguishable by its size (two to four feet tall), large bright-green, waxy leaves and purplish stem; the flowers form a greenish fleecy bloom. A third large species is the thick-leaved (T corraccum) of the Southern States, whose flowers are of different hues, the stammate flowers being white and showy, while the pistillate flowers, borne on separate plants are purplish. The tall meadow-rue (T. polygamum) towers to a height of 10 feet in favorable situations. All are fertilized mainly by the wind.

MEADOW-SNIPE. See JACK-SNIPES.

MEADOWSWEET, a well-known handsome European plant (*Ulmaria ulmaria*) of the rose family. It grows by the sides of streams and in damp places, has pinnate leaves and stems two feet high bearing corymbs of white fragrant flowers. A decoction of it with copperas is used for dyeing black, and the root has been used as a tonic. It is also called queen of the meadow.

MEADVILLE, Pa., city and Crawford County seat, alt. 1,078 feet, on French Creek, the Erie and the Bessemer and Lake Erie railroads, and important state and federal highways By rail the city is 137m. SW of Buffalo, 115m. N of Pittsburgh There are two airports, municipal and private. The nearest water transportation is that afforded by the Great Lakes; Erie, on Lake Erie, is 30m. N. of Meadville. The surrounding region is agricultural, with extensive oil fields, and Meadville and the neighboring cities engage in the iron and steel industries characteristic of western Pennsylvania. The Erie railroad has repair shops here, and the city's industrial products include castings and bearings, various kinds of machinery and tools, rayon yarn, slide fasteners, and stereoscopes, lanterns, and lantern slides Meadville has public and parochial elementary schools and a high school, and is the seat of Allegheny College (qv). The college and the city both have libraries open to the public. There are hospitals, local newspapers, banks, churches of various denominations, and a number of social and civic organizations. The Meadville Historical Society maintains a museum The old courthouse is said to have been the scene of the first primary election. See Primary, Direct. The original settlement on the city's site was made in the 1790's. Incorporation as a borough occurred in 1823; as a city, in 1866. The name commemorates Major David Mead, a Revolutionary officer and one of the city's founders; his home

built in 1797, is one of the city's points of interest. Another is the college campus. Meadville has a modified form of commission government Pop. (1930) 16,698; (1940) 18,919.

MEAFORD, Canada, lake port in Grey County, Ontario, situated on an inlet of Georgian Bay, Lake Huron, on the Canadian National Railroad, 20m W.-NW of Collingwood. It has fruit evaporating works, marble works, planing mill, steel products manufactory, bakeries, furniture factory, textile works, and foundries. It has a good harbor with a depth of 20 teet. Pop (1939) 2,759.

MEAGHER, mā'her, Thomas Francis, Irish-American soldier b Waterford, Ireland, 3 Aug. 1823, d. near Fort Benton, Mont., 1 July 1867. He was educated at the Jesuit College, Clongowes Wood, Kildare, and at Stonyhurst College (near Preston), England, became one of the principal orators of the Young Ireland party, which aimed at independence through aimed revolution, in 1818 was sent on a mission by the Irish Confederation to the French provisional government, and on 21 March was ar-rested on a charge of sedition. He was bailed, but on the passage of the Treason-Felony Act rearrested; and in October sentenced to death for treason. The sentence having been commuted to life banishment, he was removed to Tasmania (9 July 1849), but in 1852 escaped to the United States, where he was admitted to the bar in 1856 and practised in New York in 1856–61 For some time also after 1856 he edited the *Irish News* of New York In 1861 he organized a company of zouaves for the Federal army, with which he joined the 69th New York Volunteers, under command of Col. Michael Corcoran After three months' service, he recruited the «Irish brigade» (1861-62), and was elected colonel of the 1st regiment On 3 Feb. 1862 he became brigadier-general and took command of the brigade. He fought bravely at Richmond, the second Bull Run, Fredericksburg and Anticiam and after Chancellorsville found his command so reduced in numbers that he resigned. Early in 1861 he was reappointed brigadier-general of volunteers and was assigned to the command of the unlitary district of Etowah He resigned 15 May 1805, was appointed secre-tary of Montana Territory and in the following year acted at one time as governor pro tem. At Fort Benton, Mont, on 1 July 1867 he boarded a steamer for a trip down the Missouri and thereafter was never seen. It is supposed that he fell overboard unperceived during the night. He wrote 'Speeches on the Legislative Independence of Ireland' (1852). Consult Cavanagh, 'Life, Writings and Speeches' (Worcester, Mass, 1892).

MEAGRE. A fish. See MAIGRE.

MEAKIN, mē'kin, Budgett, English author and writer: b. Ealing Park, England, 8 Aug 1866, d. London, 26 June 1906 He was educated at the Reigate Grammar School became associate editor of Times of Morocco and was editor 1884-93 He lectured extensively on industrial questions and on Oriental subjects. Among his works are 'The Moorish Empire' (1899); 'The Land of the Moors' (1901); 'The Moors' (1902); 'Model Factories and Villages,' etc.

MEAL-MOTH, or MEAL-WORM. See FLOUR AND MEAL INSECTS

MEAL-TUB PLOT, in English history, an alleged conspiracy, concocted in 1679 by an informer, Dangerfield, with the view of cutting off those who were opposed to the succession of James II after he had embraced Roman Catholicism The false charges to which Dangerfield was prepared to swear were found in the meal-tub belonging to a Mrs Cellier, one of his friends Ultimately he confessed his crime, was whipped and condemned to stand in the pillory

MEALY-BUG, a scaleless scale insect of the genus Dactylopius and family Coccidæ. These insects are covered with a mealy or waxy substance which they secrete for protective purposes Like their relatives, the true scale insects, they also secrete honey-dew and are attended and transported by ants, unlike are attended and transported by ants, unlike these relatives they do not lose the power of locomotion. The species are most numerous in tropical and sub-tropical countries; one species (D citii) being the best-known outdoor species in the United States, feeding upon citrus trees. in Florida In greenhouses another species (D destructor) is often troublesome Owing to the protective covering difficulty has been met in ridding plants of these creatures, but fumigation and caustic solutions have been tried with most satisfactory results, a kerosone and soap emulsion being particularly effective in destroyemission being particularly effective in destroy-ing them. (See INSECTICIDE) Consult Com-stock, J H and A. B. 'Manual for the Study of Insects' (8th ed, New York 1909), Com-stock, J H., 'Report of the United States De-partment of Agriculture' (Washington 1880)

MEALY WING, a minute bug of the family Aleyrodidæ, whose species (about 150 m number) have the wings covered with a white meal-like secretion. They are allied to the coccids, but differ in development and structural peculiarities; and throng upon the leaves of plants which they injure by sucking away the sap and also by attracting a growth of smut-fungus by their secretion of honey-dew In this manner they blacken and harm orange and lemon trees in parts of Florida and Louisiana, where they are prevalent. Consult Howard, 'Insect Book' (1901).

MEAN VALUE. If n quantities are commensurable, the sum of their units divided by n, the number of the quantities, is the arithmetical mean and is the mean value of the n quantities when their number is finite. For example, if the number of units in three quantities are respectively 4, 8 and 15, the mean

value is $\frac{4+8+15}{2}$ = 9; and in general, if the

number of units in n quantities is denoted by $X_1, X_2, X_2, \ldots, X_n$, the mean value is

$$M = \frac{1}{n} (X_1 + X_2 + X_3 + \dots + X_n).$$

But if a quantity vary continuously in accordance with some law, thereby assuming every possible value between two extremes, the number of different quantities is infinite, and the mean value in such a case requires a new definition. For example, assume that at every point in the diameter of a semi-circle a perpendicular to the diameter is drawn to meet the

semi-circle The lengths of these lines form a continuous series of values represented by every number from zero to r, where r is the length of the radius. In such a case if n values of the perpendiculars are obtained and their sum is divided by n, the ratio should approximate to the mean value. It is easy to see, however,

that this ratio will approximate to $\frac{2}{\pi}$ of the radius of the circle if the *n* perpendiculars are evenly spaced on the circle, to $\frac{\pi}{4}$ of the radius

if they are evenly spaced on the diameter. It follows that the mean value of a continuously varying quantity is not definite until the law is known by which the "weight" of each portion

of the scope of variation is determined. The several forms of the theorem that pass The several forms of the theorem that pass under the name of the mean value theorem involve the principles of the infinitesimal calculus. The first theorem of the mean value is the following. Let f(x) denote any finite and continuous function of x in the interval between $x = x_0$ and x = X, let dx denote the increment and ratio the series for in the interval. and retain the same sign in this interval; and assume that m and M are respectively the least and the greatest values of f(x) in this interval:

then the definite integral $\int_{x_0}^{X} f(x)dx$ has a defi-

nite value that is greater than $m(X-x_0)$ and less than $M(X-x_0)$; that is,

$$m \int_{x_0}^{X} dx < \int_{x_0}^{X} f(x) dx < M \int_{x_0}^{X} dx$$

Since f(x) is continuous in the interval $X-x_0$, there must be a value $x=\xi$, where

$$X - x_0$$
, there must be a value $x = \xi$, where $x_0 < \xi < X$ such that $\int_{x_0}^X f(x) dx = (X - x_0) f(\xi)$, $m < f(\xi) < M$. The value, $f(\xi) = \frac{1}{X_0 - x} \int_{x_0}^X f(x) dx$,

is called the *mean value* of f(x) in the interval $X-x_0$. If we assume F(x) to be the primitive or indefinite integral of f(x), then $F(X)-F(x_0)=(X-x_0)f(\xi)=(X-x_0)F(\xi)$ which is the familiar form of the law of the mean

in the differential calculus The theorem of mean value is of importance in establishing Taylor's series It follows immediately from the theorem of mean value that if $F(X) = F(x_0) = 0$, for some ξ between X and x_0 . $F'(\xi) = 0$, if F is continuous between X and x_0 . Let ϕ be a function of X with derivatives of every order at every point between x=a and x=b. Construct the function

$$\psi(z) = \phi(X) - \phi(z) - (X - z) \phi'(z) - \frac{(x - z)^2}{a!} \phi''(z)$$

$$-\dots -\frac{(x-z)^n}{n!}\phi^{(n)}(z)-\frac{(x-z)^{n+1}}{n+1}p,$$

where X is of the form $x_0 + h$, and X and x_0 lie between a and b. ψ' will be of the form $-\phi'(z) + \phi'(z) - (X - z)\phi''(z) + (X - z)\phi''(z) - \dots - \frac{(X - z)^n}{n!}\phi^{(n+1)}z + \frac{(X - z)^n}{n!}p$, or

$$\frac{(X-z)^n}{n!} \phi^{(n+1)}z + \frac{(X-z)^n}{n!} p$$
, or

$$\frac{(X-z)^n}{n!}[p-\phi^{(n+1)}(z)].$$

Furthermore, $\psi(X)$ is identically 0, and by properly choosing P, $\psi(x_0)$ can be made 0.

Therefore, by the theorem just stated $\psi'(z) = \frac{(X-z)^n}{n!} [p-\phi(n+1)(z)]$ vanishes for some value of z between x_0 and x. As it can be shown that this value need not be X itself, we have $p-\phi(n+1)(z)=0$ for some value of z between x_0 and X, and since $\psi(X)=0$, if we let $X=x_0+h$, we have $\phi(x_0+h)=\phi(x_0)+\phi'(x_0)h+\ldots+\frac{\phi(n)(x_0)}{n!}h^n+\frac{\phi(n+1)(x_0+\vartheta h)}{(n+1)!}h^{n+1}$, where $0<\vartheta<1$. Therefore, if $\frac{\phi(n+1)(x_0+\vartheta h)}{(n+1)!}h^{n+1}$ can be made as small as you please by increasing n, we have $\phi(x_0+h)=\frac{\infty}{0}\frac{\phi(n)(x_0)h^n}{n!}$, which is Taylor's theorem. See Series Consult Osgood, 'Differential and Integral Calculus' (rev ed, New York 1914).

MEANDER, mē-ăn'der, in art, an ornamental design, in which the lines interlace, it is often used in decorating vases. The lines usually advance in one direction and pass one another at right angles. The design is so named from the river Meander, well known for its numerous windings.

MEANDERS, broad swinging curves made by a river on its flood plain. A river in its early history may have accidental curves, but it is only when it has cut its course as deeply as it can, and has begun to widen its valley notably, in other words when it has passed its maturity and is progressing toward old age, that it characteristically develops meanders. These frequently become almost perfect loops many miles around and but a few rods across the neck. When a meander cuts off and is occupied by stagnant water only, ox-bow lakes are formed. If a region in this stage is uplifted the river will again begin to deepen its valley, and the meander curves will cut down anew, forming deep valleys or gorges. They are then said to be entrenched or incised meanders. Sometimes the neck of an incised meander may be cut through at river level, by undermining the rock, leaving a natural bridge See Natural Bridge, and the section on Work of Running Water in the article on Geology

MEANING, the object of a symbolization, considered from the standpoint of the symbol Thus the meaning of the figure 2 is the number two, the meaning of the formula $(x+y)^2 = x^2 + 2xy + y^2$ is the law that formula represents, and so on indefinitely The experiences which we undergo possess besides their presented content a represented content and this represented content bears toward them the relation of meaning. One of the cardinal problems of modern psychology is the determination of the psychical concomitants of this meaning In accordance with the general nominalistic and associationalistic trend of experimental psychology, those who approach the question of meaning from this angle have usually considered that the meaning of an image is conveyed in consciousness by a group of such accompanying substantive states as images, sensations and feelings They held, that is, that the meaning of "bear" read into a noise in the woods is "carried by a verbal image and an organic shudder,"

and that every experience is surrounded by a fringe of vaguer meaningful states. They would consider that the vehicle of the law of universal gravitation is a visual or auditory verbal image, together with certain organic and kinæsthetic sensations.

All this psychology of meaning suffers from the lack of an antecedent logical analysis. The logical situation best adapted to this analysis is that of the relation of a set of mathematical symbols to the theory they represent The theory is obviously the meaning of the symbols, but it is only to the very slightest extent carried by the individual symbols themselves Only the elementary constituents of the system, together with certain of the simpler general notions, are represented by special characters The structural relations are signified, and must be signified, by the arrangement - that is, the structural relations of the symbolism on the paper. The essence of the conventional system of algebraic notation hes, not in the use of let-ters for numbers, not in the symbolizing of addition by + and of multiplication by X, but in the agreement between the laws of the manipulation of the symbols and the laws of number Symbolization is primarily the relation toward a system of entities of a similarly order system of arbitrary marks, and only in a derived sense the relation between a mark and the corresponding entity The symbol is a symbol only within a symbolism. It is precisely as a symbolism that our verbal images, kinæsthetic sensations and other mental states convey a meaning. When the mathematician is developing a new theorem, his mental content may be inventoried as a verbal image or two, his sensation of the paper and pencil in front of him, and a few organic sensations Somehow or other he puts these into an entirely extraneous correlation with the entities which he is examining This strain behind the eyeballs acquires a temporary association with the unknown function for which he is seeking; that fragmentary visual image of a formula represents a mathematical law; and so on. In his trained mind, the symbolism of his states shapes itself into the desired conclusion, which he symbolizes anew in the conventional algebraic notation on the paper lying before him. No enumeration of his sub-stantive states can ever disclose how the meaning of the conclusion and the premises is carried in his mind, for it is not these states themselves, but their arrangements, that are the vehicles of meaning.

This structural nature of the vehicle of meaning is intimately connected with our power to communicate with others. My sensation of red is something that as far as I know may be peculiarly mine. If there were a man who from his birth had seen red where I see green and green where I see red, it would be a matter of the utmost difficulty for me to detect his anomaly. He would learn the name "red" from hearing it applied to the things which appear red to me but green to him, so that his speech would not disclose his peculiarity. It is only by observing that green objects excite in him the expression of the emotions which we consider appropriate to red, or by some similar peculiarity in the associations of his experience of red and green objects, that the interchange of his red and green sensations could even be sus-

If the interchange were his sole pected. peculiarity, he would always consider humself, and be considered by others, in the light of a normal human being Accordingly, we have no reason to believe that the sensory qualities or sense-data of normal human beings agree with our own sensory qualities and sense-data, and there is no way of conveying these qualities and data by language On the other hand, language is the vehicle of meaning and of nothing This alone is enough to prove that the meanings do not reside in any special data or malities in our minds What language does is qualities in our minds to order the mind of the hearer or reader in a manner similar to that of the speaker or writer In reading a story we pass through a sequence of mental states which has been designed for us by the author, though our individual states are beyond his knowledge. When he uses the word "green," we interpret it in our own way, but we put it in the same sort of relational context - complementary color of red, intermediate between yellow and blue, etc -- as that which it occupies in his mind. It, therefore, that this relational context, which is all that language can convey, 15 identically the meaning conveyed by language

The situation when we hear a noise in the bushes and interpret it as "bear" can now be analyzed. The meaning is not carried in the first instance by the verbal image and the shudder. It is true that there is a possible state of consciousness in which the rustle in the bushes, the verbal image, and the shudder are all that is present, but at this stage meaning has not yet appeared. Meaning first appears when we think, not "bear," but "That's a bear." In this case, the rustle in the bushes stands for "that," the shudder or verbal image for "bear" and the juxtaposition of the shudder or image with the sound impression for the relation expressed in the sentence. The meaning of "bear" is derived from the meaning of the sound in the bushes resides, not in its correlates, but in its correlation. (See Thought). Consult James, W., 'Principles of Psychology' (New York 1899); Stout, G. F, 'Manual of Psychology' (London 1913); Titchener, E. B., 'Experimental Psychology of the Thought Processes' (New York 1909).

NORBERT WIENER.

MEAMS, David MacGregor, American lawyer. b. Groton, Mass, 1 May 1847; d 24 May 1931. He was graduated from Yale in 1868, studied theology at Andover and New Haven, was professor of economics in Middlebury (Vt.) College in 1877–80, and in 1881 was admitted to the bar and entered the practice of law He contributed to periodicals, and wrote 'The Boss' (1894); 'Industrial Freedom' (1897); 'The Methods of Taxation' (1909).

MEANS GRASS. See Grasses in the United States.

MEANTONE, or MESOTONIC TEM-PERAMENT, in music, the system or principle of tuning voices or instruments in vogue up to the middle of the 19th century, when it was superseded by the system of equal or even temperament. In the meantone temperament, tuning was based on the use of a standard whole step or mean tone, which is an interval between

a greater and a less major second. See Mode; Well-Tempered Clavier

MEARES, merz, John, English navigator: b. England, 1756; d London, 1809. He entered upon a scafaring life at an early age and in 1771 he entered the navy and served in the war with the French until peace was declared in 1783, when he became a captain in the merchant service. In 1786 he explored the coast of Alaska and made in 1789 a second tour of exploration on the discoveries of which the British government based its claim to the possession of British Columbia and Oregon. Three ships sent by him to Nootka Sound in 1789 were captured by the Spaniards and this act caused England to fit out an expedition in the following year, upon which reparation was made by Spain. He was the author of 'Voyages in the Years 1788–89, from China to the Northwest Coast of America' (1790).

MEARIM RIVER, Brazil, rises in the Sierra do Negro, and after a northerly course of about 360 miles in the state of Maranhão flows into the Bay of São Marcos near the city of Maranhão. It has numerous affluents and is navigable, but the sudden tidal bores are dangerous.

MEARS, Helen Farnsworth, American sculptor: b Oshkosh, Wis, 1878; d. 17 Feb. 1916. Her early years were passed in Oshkosh, Wis, where she began her art work as a child by carving a life-size portrait of her sister from a block of solid plaster. She studied under Saint-Gaudens, who recommended her as one of the strongest pupils he ever had when he sent her to Frederick Macmonnies in Paris. She was particularly known for her portrait busts. Her memorial statue to Frances E. Willard in the capitol at Washington (1905) was the first statue of a woman by a woman placed in that building. In 1911 her design was accepted for a statue for the new Wisconsin State house. Before that she had done much work of note, including the MacDowell basceliefs, familiar to visitors at the Metropolitan Museum, New York, and at the MacDowell Club; a 'Fountain of Life,' which won a prize at the Saint Louis exposition. Other works are the portrait relief of Augustus Saint-Gaudens and the portrait busts of George Rogers Clark and William L. G. Morton, M.D., in the Smithsonian Institution, Washington.

MEARS, James Ewing, American surgeon: b. Indianapolis, Ind, 1838 He was graduated at Trinity College, Conn., in 1864, and at Jefferson Medical College, Philadelphia, in 1865. He served in the Civil War and in 1865 established his practice in Philadelphia. He held the chair of anatomy and surgery at the Pennsylvania College of Dental Surgery from 1870 to 1898 and for many years was surgeon-in-chief of the Pennsylvania National Guard. He published 'Practical Surgery' (1878; 2d ed., 1885), and numerous contributions to surgical journals Deceased.

MEASLES (also called RUBEOLA and Morbilli), a highly contagious cruptive disease, frequently epidemic, and sometimes dangerous because of its debilitating effects and tendency to end in inflammation of mucous membranes, such as pneumonia and enteritis. So-called black or malignant measles, occurring mostly in persons

of very poor health, is usually fatal Where frequently epidemic it is less likely to be severe, and where it attacks a community for the first time it has a high mortality For instance, it was taken to the Fiji Islands by a British ship from Australia and swept away 40,000 out of 150,000 inhabitants Although measles is a disease of childhood, adults are not exempt from it. As a rule it attacks an individual but once. The contagious principle exists in the breath and in exhalations from the skin, the tears, the nasal and bronchial secretions and the excretions. Clothing which has been in an infected atmosphere is liable to spread the discase. How long the contagium remains in infected articles is not known. The disease may be divided into four stages, beginning with the stage of incubation, or the interval (varying from 7 to 21 days) between the date of infection and the outbreak of symptoms, that is, the stage of invasion The symptoms are chilliness, fever, pain in head, back and limbs, bloodshot eyes, with intolerance of light, running of the eyes and nose, sneezing and a troublesome cough About the fourth day an eruption or rash appears (stage of eruption), first in the throat, then upon the face, trunk and extremities, as minute pinkish red spots, which coalesce into blotches more or less crescentic in shape, raised above the surface of the skin. The eruption usually last about three or four days Gradually disappearing (stage of decline), fever and catarrhal symptoms abate, and appetite re-turns The cough may remain for days The turns The cough may remain for days The patient should be kept in a warm, well-ventilated and fairly lighted room, should be given easily digested food and plenty of water. Treatment should also regulate the bowels with saline medicines, and allay the severity of the cough with simple remedies Severe symptoms require the attendance of the physician. Complications may ensue in the shape of chronic inflammation of the tonsils, of laryngitis, of chronic Bright's disease and of otitis; but the most serious complication is that of bronchopneumonia, which occurs in about 25 per cent of cases of measles. Measles is contagious until the eruption has disappeared and all dead particles of skin have come away of themselves or have been washed off by tepid baths

MEASURE, a definite unit of capacity or extent, fixed by law or custom, by which relative sizes and capacities are ascertained and expressed; as, a yard, a measure of length; a gallon, a measure of capacity; a square foot, a measure of area; a cubic foot, a measure of volume, etc. See Weights and Measures.

Lineal Measure.—The measure of lines or distances; the standard unit of lineal measure in the United States is the yard The system is based on the law of nature that the force of gravity is constant at the same point of the earth's surface, and, consequently, that the length of a pendulum which oscillates a certain number of times in a given period is also

Unit of Measure.—A given quantity, used as a standard of comparison in measuring a quantity of the same kind. Every kind of quantity has its own unit of measure, and under different circumstances the same kind of quantity may have different units of measure.

Line of Measures.— The line of intersection of the primitive plane, with a plane passing through the axis of the primitive circle and the

axis of the circle to be projected.

Measure of Angles.—The right angle being taken as the angular unit, its subdivisions are degrees, minutes and seconds The right angle contains 90 degrees, the degree 60 minutes and the minutes 60 seconds All smaller fractions are expressed decimally in terms of the second

Measure of Magnification.— The measure of magnification, or magnifying power of any optical instrument, is the ratio of the magnitude of the image to the magnitude of the object. or, more precisely, the ratio of the apparent diameter of the image to that of the object,

Measure of a Ratio .-- Its logarithm, in any system of logarithms, or the exponent of the power to which the ratio is equal, the exponent of some given ratio being assumed as unity

In Music .- The quantity of notes which are placed in the bar, and which is generally called the time, of which there are but two kinds, namely, common time, containing an equal quantity of notes in the bar, and triple time, containing an unequal quantity Common time is generally marked with a C at the beginning, which means that every bar contains four crotchets, or their value in other notes There are also other kinds of common tune which are marked 2, 4, 3, Triple time is marked \$, \$, \$, \$, \$.

MEASURE FOR MEASURE is the most characteristic of the group of so-called "dark comedies" produced in Shakespeare's middle period. Modern cutics are agreed that 'Measme for Measure, first printed in the 1623 folio, must have been composed about 1603; and the critics' opinion, based almost solely upon evidence of style, can now be confidently supported by a piece of external evidence lately redeemed from suspicion of forgery, namely, a memorandum in the accounts of the royal memorandum in the accounts of the royal Revels Office which records that 'Measure for Measure' by "Shaxberd" was performed before King James by His Majesty's Players on Saint Stephen's night, 26 Dec 1604. Few of Shakespeare's greater works are so unequal in quality or have evoked such diverse opinions In certain details of form it is one of the most careless of the plays. The subject is intrinsically displeasing to modern taste (though vastly more refined here than in the original story); several of the characters (notably the goody-goody Duke and the unmanly Claudio) repel the reader; and many of the devices of plot, especially in the perfunctory closing act, are frank clap-trap On the other hand, Shakespeare's moral beauty and dramatic brilliance are nowhere more loftily exemplified than in the best scenes—those, namely, in which Isabella's gracious figure appears. In a word, this play marks, and is the first to mark, the complete ascendency of spirit over form so notable in the last plays of 8 or 10 years later; it is the earliest to make conspicuous Shakespeare's utter heedlessness of rules and details and his uncarrny splendor in silhouetting moral beauty against an all-encompassing mundane vileness "This is a play as full of genius as it is of wisdom," says Hazlitt, and Masefield in a notable appreciation calls it "one of the greatest works of the greatest English mind." There is no evidence that 'Measure for Measure' has ever been much performed (except in Germany), though an injudicious attempt to blend it with 'Much Ado about Nothing' ('The Law against Lovers,' by Sir William Davenant) was popular in the latter half of the 17th century. Yet two English revivals in 1907 and 1908 (one by the company of Oscar Ashe and Lily Brayton, the other by the Oxford University Dramatic Society, supported by actresses) proved marvelously impressive. They fully established both the science morality of the piece when honestly presented and also the genuine effectiveness of the usually slighted come scenes. Shakespeare's source was a long, flashy play in two parts (10 acts), 'Promos and Cassandra,' by George Whetstone (1578), which in its turn is derived from an Italian tale in Cinthio's 'Hecatommuthi.'

TUCKER BROOKE.

MEASUREMENT OF SHIPS FOR TONNAGE, or BUILDER'S MEASURE-MENT, a method of computing the tonnage of merchant vessels, in use among shipbuilders lis results are nearly double the legal or registered tonnage See Tonnage

MEASUREMENT OF STREAMS. One of the many useful classes of work conducted by the United States Geological Survey, the measurement of streams having an industrial value Wherever water is likely to be employed for power or irrigation the amount available is ascertained by that bureau. The volume varies greatly from season to season, and sometimes from year to year Any calculation by the manufacturer or farmer which does not take this variability into account would be misleading. Moreover, streams differ among themselves in straightness, the character of their beds and other particulars Accurate measurement is still further complicated by the lack of uniformity in the movement in a given cross section. might be true for one point would not be true for other points to the right or left of it, or at a higher or lower level

The first step in the work is to place a gauge in a permanent position, and employ a suitable observer to read it every day. The gauge is graduated to feet and tenths. Usually it is upright. It may be laid over slanting, however. In that case, the spacing is widened, so as to give accurate results. One observation a day is made, and its results transmitted on a postal card to Washington. The second factor in the hydrographer's computation is the velocity of the stream, at different heights. To ascertain this only occasional measurements are necessary. These are made by experts, but with their aid it is possible to prepare tables showing the total discharge of that particular stream for all the different gauge readings. After such tabulation is effected the maximum, minimum and mean flow for any month in the year can be told at a glance.

Velocity is ascertained with a meter lowered into the water. The instrument contains a tiny screw propeller, the number of whose rotations under the pressure of the fluid is automatically registered. Many types of meter have been devised. The kind which the bureau prefers has an electric wire leading up to a buzzer in the operator's pocket. There a click or other audible sound indicates to him the speed of the screw. He counts the number of revolutions for some definite period, usually fifty seconds, records it in his notchook and moves along a short distance to make another observation.

If measurements are made at various depths along a vertical line, the results will not be equal. For this reason hydrographers have studied to find, if possible, a level that would fairly represent the average velocity for any vertical. In this way they can simplify the labor. It has been found that such an average can be secured by taking the speed at a depth of from six-tenths to two-thirds of the way down from the surface. To obtain a correct idea for the whole stream, though, these tests must be made at a number of places between one shore and the other. No measurement at a single point can be trusted to be fairly representative.

MEASURING WORM, INCH WORM, LOOPER, or SPAN-WORM, a caterpillar of any species of moth of the superfamily Geometrida. The creatures are characterized by the presence of only two pairs of abdominal legs, one upon the ninth, the other upon the anal segment, and by their peculiar form of locomotion, the rear of the body being brought forward toward the front legs and the body forming a loop at right angles to the surface upon which the insects walk. Nearly all the numerous species feed upon foliage, a few upon seeds in which they bore. Some are considered serious pests in orchards and upon shade trees, for instance, the canker worms (see APPLE, Insects), the lime-tree moth (Hyberma tiliaria), and Cymatophora pampinaria, which sometimes devastates cranberry plantations. The duration of the larva state is variable; from their great voracity they grow rapidly and shed their skins several times before attaining maturity; when arrived at this state they seek some sheltered spot in which to undergo the change to pupa form, some clinging to the lower surfaces of leaves while others bury themselves in the earth, those remaining in the air suspending themselves in various ways by means of their silky secretions, others enclosing themselves in silky cocoons Those burying themselves also build cocoons around them, but many of these only line their cavity with enough silken threads to keep the wall from falling in. One of the European species, Fidonia Plumistaria, is distinguished by curious feathery antennæ. The caterpillars of this species are very injurious to fruit trees, especially those of the European magnie moth, Abraxas grossulariata, which inhabit gooseberry bushes, often entirely stripping them of their foliage. The caterpillar of the American canker worm moth. Anisopteryx pometaria, also belongs to this species of worm, the eggs being hatched in the spring; when grown they are about an inch long and of various colors, and are also dangerous to orchards Most of the species, however, are of small economic importance. The caterpillars usually resemble twigs when at rest, their protective coloring and their attitudes serving to deceive their enemies. The caterpillars of a few species of the owlet moths, family Noctuidæ, walk in this way, since they also lack prolegs upon the middle abdominal segments They are not, however, considered true measuring worms. The geometrid moths are usually of small size and inconspicuous but delicate and beautiful coloration Consult Holland, 'The Moth Book' (New York 1903); and Packard's 'Monograph of the Geometride,' with colored plates, published by the United States Geological Survey (Washington 1876); 'Cambridge Natural History' (Vol. VI, London 1899); Comstock, J. H. and A. B., 'Manual for the Study of Insects' (8th ed., Ithaca, N. Y., 1909).

MEAT, Inspection of. The main purpose

of meat inspection is to eliminate diseased or otherwise unfit meat from the food supply Competent examination of food animals immediately before and at the time of slaughter and effective official control of condemned ma-terial until it is destroyed for food purposes protect the public against the use, for food, of diseased meat or other meat from animals having noxious qualities Some countries, States and municipalities maintain inspection systems which require ante-mortem and post-mortem inspection only. Such inspection would be effective in protecting consumers were fresh meats only used for food. In all civilized countries, however, methods of curing, preserving, and treating meat have been adopted which involve considerable possibilities of (a) development of spoilage, (b) contamination, (c) adulteration and addition of harmful substances and deceptive coloring matter, and (d) unhygienic conditions in connection with processing and handling the meat. An adequate system of handling the meat meat inspection furnishes proper protection to the public by maintaining supervision through-out all stages of handling from the time the live animal is submitted for slaughter to the point where the finished meat or meat food product is ready for the consumer trade. Although most nations maintain meat inspection there is considerable variance in the scope and effectiveness of the inspection furnished.

In the United States, the Federal Government, some States, and some municipalities have provided laws or ordinances to protect the health and rights of consumers of meat and meat food products derived from cattle, sheep, swine, and goats. The Federal Government has jurisdiction in slaughtering and meatprocessing establishments the output of which, in whole or in part, enters into interstate or foreign commerce. It has no jurisdiction in establishments engaged only in intrastate trade. About two-thirds of the meat and meat food products produced in the United States are prepared under Federal inspection. The remainder is either inspected under systems administered by State or municipal authorities, or is not inspected at all. The Federal system of inspection is administered by the Department of Agriculture, with the Bureau of Animal In-

dustry in charge of the service.

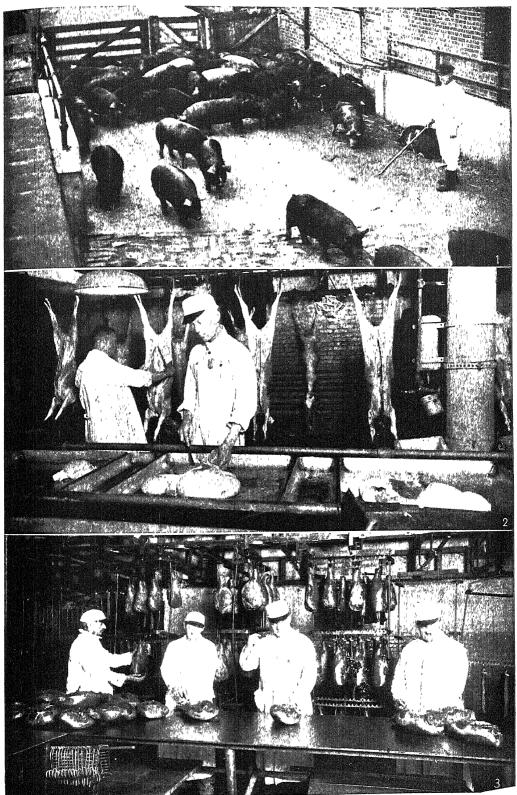
The first national legislation authorizing meat inspection was passed by Congress 30 Aug. 1890 and was intended as an aid to the exportation, to European countries, of food animals and meat. This law was found to be inadequate for the purpose and on 3 March 1891 a law was enacted which broadened the scope and effectiveness of the inspection. This law was amended by Act of Congress of 2 March 1895 to bring about better control of condemned meats. These early laws were not sufficiently far reaching, particularly in the control of sanitation of the inspected establishments and supervision of the preparation of meat food products. During the war with Spain in 1898 the public was aroused by the claim that American packers operating under inspection were furnishing the War and Navy Departments with

"embalmed beef". Investigation failed to establish this and the public remained apathetic in the matter until the publication in 1906 of Upton Sinclair's book (The Jungle,) in which it was charged that the conditions in the slaughtering establishments in Chicago, the packing centre of the country, were filthy and that the menace to the public health was great. The The nation was again aroused and on 30 June 1906, upon the insistence of President Theodore Roosevelt, there was enacted a comprehensive meat inspection law. Briefly stated, this law, which is still in effect, provides for (a) good sanitary conditions at inspected establishments, (b) ante-mortem and post-mortem inspection of cattle, sheep, swine and goats, (c) supervision over the preparation of meat and meat food products to insure cleanly procedures, (d) rejection of harmful dyes, preservatives, chemicals or other deleterious substances, (e) custody of condemned material until it is destroyed, (f) placing the marks of inspection on inspected and passed meat and meat food products or containers thereof, and (g) guarding against the use of false or deceptive labels. This law has been supplemented to provide for the inspection of imported meats and to include the inspection of horses and the meat thereof intended for human food. In accord with the limitations of the Constitution, the Federal statutes dealing with meat inspection are not applicable to slaughtering and meat processing establishments the meat and meat food products of which are not transported outside the State in which the establishment is located. The law exempts from inspection the meat derived from animals slaughtered by any farmer on the farm and transported outside the State, and a qualified exemption from inspection is provided for retail butchers and retail dealers supplying their customers in another State. The Secretary of Agriculture may, at his discretion, maintain the inspection provided in the act for any slaughtering, meat canning, salting, packing, rendering, or similar establishment even though the persons operating the same may be retail butchers, retail dealers, or

In the Tariff Act of 3 Oct. 1913, and in subsequent tariff acts, the law of 30 June 1906 was supplemented by requiring the inspection of meats imported into the United States. The regulations provide that each consignment of meat offered for entry into the United States be inspected and passed and so marked before entry is permitted. It is also required that such consignments be accompanied with certificates of inspection, bearing the name of a high offi-cial of the country of origin, declaring that the meat has been derived from cattle, sheep, swine, or goats which were examined and passed by veterinarians immediately before and at the time of slaughter, and that the product covered by the certificate is sound, healthful, wholesome, and fit for human food. Consignments of meat which are found to be unsound or unfit when offered for importation are either destroyed in the presence of an inspector or returned to the country of origin.

The Horse Meat Act, amendatory to the Act of 1906, was approved 24 July 1919, the main purpose of the legislation being to provide the means of exporting healthful and clean horse meat to other countries and fur-

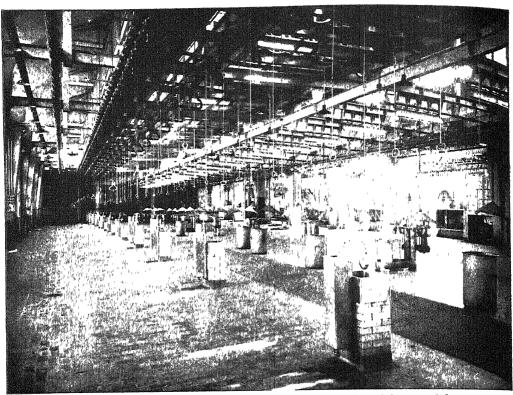
MEAT



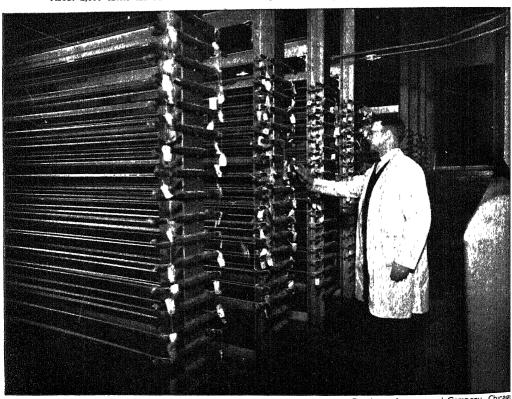
Courtesy, Burcau of Animal Husbandry, United States Department of Ag

Top. Ante-mortem inspection of hogs

MEAT



About 2,000 cattle can be skinned and dressed daily in the Chicago plant of Armour and Company.



Courtesy, Armour and Company, Chicago

Part of dry room where surgical ligatures are processed under constant temperature and humidity control.

nish an outlet for the excess horses, principally from the open ranges of the Rocky Mountain region. The law provides for the inspection of live horses and horse meat tood products at establishments the output of which, in whole or in part, enters interstate or foreign commerce for purposes of human food. These establishments are required to be maintained separate and apart from establishments in which the meat or products derived from cattle, sheep, swine, and goats are prepared under inspection for human food. It is a requirement of law that all inspected horse meat be plainly marked "Horse Meat" or "Horse Meat Product." The market for horse meat is found mostly in Europe. Very little is consumed in America as human food.

Broadly considered, the system adopted in the United States consists of seven essential and related parts; namely, sauntation, ante-mortem inspection, post-mortem inspection, products inspection, laboratory inspection, control and destruction of condemned material, and mark-

ing and labeling.

Sanitation. — An establishment is not granted inspection until the requirements as to the sanitation of the establishment and premises have been acceptably met and proper facilities provided for conducting the inspection Some of the important requirements are—abundant natural light and ventilation in meat-handling rooms not maintained under refrigeration, good floor drainage, modern plumbing and sewerage, use of impervious and smooth material in the construction of equipment and in surfacing sidewalls and floors, abundant and pure water supply with hot water under pressure for cleaning purposes, modern-type toilet rooms, dressing rooms for workers, and ready means for cleansing hands and arms and disinfecting utensils. Not only are the requirements as to type of buildings and quality of equipment rigid, but special emphasis is placed on cleanliness throughout all processes, such as dressing carcasses, curing meat, preparing sausage, render-mg and refining lard and edible tallow, mg and refining lard and edible tallow, preparing compounds containing animal and vegetable fats, and canning meat foods. No person affected with a communicable disease may be employed in any department where meats are handled or prepared.

Ante-mortem Inspection.—Animals about to be slaughtered are examined for signs of any disease or condition that may cause condemnation of the carcass or any part of it. Any animal found to be badly diseased or otherwise unfit for food purposes is removed from the companion animals and is not allowed to be taken to the slaughtering department, but after marking with special identifying metal car tags is either killed and destroyed for food purposes or held in the custody of the inspector until recovery is complete. An animal found with infections or conditions which might cause condemnation of the carcass is segregated from the healthy appearing animals and after being ear-tagged as a "U. S. Suspect" is held and slaughtered apart from other animals. This procedure furnishes opportunity for close expert examination of the live animal and special postmortem inspection by a veterinarian. Competent veterinary ante-mortem inspection is an important part of an effective meat inspection service, as without it animals stricken with disease dangerous to human health and those sick or showing other obnoxious conditions would be apt to be used for food purposes.

Post-mortem Inspection.—In the Federal service particular stress is placed on the post-mortem veterinary inspection. The inspectors assigned to these duties are in close attendance upon all phases of the killing, skinning, eviscerating, and dressing of each animal to search for signs of disease and other questionable conditions and to enforce sanitary regulations.

When the number of animals dressed per hour does not exceed certain general limits, one inspector performs all phases of the inspection. When the number of inspections per hour exceeds certain general limits, the number of inspectors is increased accordingly and the work so arranged and co-ordinated that each inspector gives his entire attention to some particular part of it. Then through the use of specialized equipment for conducting operations and inspections, such as by moving conveyor systems for moving carcasses and viscera and parts in apposition or otherwise maintaining complete identity of them, two, three, four or five inspectors may participate in the inspection of a single carcass, with complete efficiency. It is a requirement that means be furnished to insure the identity of several parts and organs with the carcass during the various stages of post-mortem inspection in order that they may be assembled correctly should disease be found in any of them.

The different steps of the routine post-mortem inspection of cattle and hogs are: Head inspection, viscera inspection, carcass inspection, final inspection, disposition, and marking. The inspection of other animals is similar in principle though different somewhat in procedure

ciple, though differing somewhat in procedure. Immediately after the bleeding of the animals it is customary for the establishment operatives to skin and sever the heads of cattle, calves, and horses with the carcasses sufficiently suspended above the floor to prevent the heads from touching the floor. The head is viewed, palpated, and incised, as may be necessary, but repeated incisions of the principal lymph glands are required. The cheek muscles of bovines, except young calves, are deeply laid open and search made for certain cysts capable of producing tapeworms in man. Other examinations are made of the head and tongue. The heads of horses are split sufficiently to permit inspection for evidence of glanders, now a very infrequent disease in the United States.

After the carcasses of swine have been dehaired and made clean, an establishment operative in the presence of the inspector prepares them for the head inspection by disjointing and partially severing the heads of the suspended carcasses. The inspector makes incisions into certain lymphatic glands, which are favored seats of tuberculosis, and otherwise inspects the exposed tissues. Diseased or suspected car-

casses are tagged by the inspector.

The evisceration of carcasses is conducted in the presence of the inspector. Each set of viscera is examined. The organs and principal lymph glands are closely examined and some are cut into. The lungs and liver with associated lymph glands are particularly searched for indications of lesions of disease and for the presence of parasites. The spleen, particularly of swine, and the heart often disclose evidence of disease, if present, and careful attention is given these organs. If any condition is

found which in itself cannot be properly judged at the moment, the carcass, parts, and viscera are properly tagged and set aside for the final

inspection

Carcasses, other than those routed to the place of final inspection after evisceration and other preparation, are examined on all exposed surfaces and the tissues incised, if necessary. The inspector must assure himself that each carcass is clean and wholesome in all respects For cause, carcasses are tagged and sent to the

place of final inspection.

The final inspection includes particularly expert examination of the difficult cases found in the other steps of the post-mortem inspection If conditions are found that make it desirable to have the aid of laboratory investigation, including biological tests, to gain information or to reach a decision as to the disposition of a carcass, specimens are collected and forwarded to one of the branch laboratories of the Bureau of Animal Industry maintained at outside points, or they are sent to the main research laboratories of the Bureau at Washington, D. C

The regulations governing the Federal meat inspection are published in booklet form and are comprehensive. They are mandatory as to the disposition of carcasses and parts of animals found on ante-moitem and post-mortem to be affected with certain diseases, parasites, and conditions Since it is recognized, however, that much must be left to the judgment of the inspector as to when a disease is noxious or when a condition is objectionable, under the standards of hygiene, certain principles and directions have been incorporated in the regulations for the guidance of inspectors.

The destruction of condemned material is accomplished by reducing it to denatured grease and tankage residue or, at establishments not having facilities for tanking, by effective treatment with crude carbolic acid or other approved denaturant or by incineration. All condemned carcasses and other condemned material remain in the custody of the inspector until destroyed at the same establishment where condemned.

Marking and Labeling.—By means of official tags, seals, and locks, in accordance with the need, the service maintains accurate identity and control of inspected animals, carcasses, and products Each kind of retention tag is prepared in serially numbered form which facili-

tates ready recording and checking.

The marks of inspection are placed upon freshly dressed, passed carcasses of cattle, sheep, swine, and goats by marking devices furnished by the Government and using for the purpose a harmless, purple, quick-drying fluid Each primal part is marked, except that carcasses, the meat of which is to be processed in an inspected establishment, may receive less than the usual number. This mark is circular in outline and shows in abbreviated form the legend "U. S. Inspected and Passed" and the official number of the establishment

As meat foods are brought into final form in the products departments, those that are sound and wholesome and adaptable to receive legible inspection marks directly upon the product itself, such as hams, bacon, backs, dry salt pork and sausage in casings of the ring variety or larger, are marked All devices for applying the marks of inspection directly upon the meat are kept under official custody.

Any can, jar, or other receptacle constituting the immediate container of passed product is marked by a trade label, which must be officially approved before its use is permitted sential requirements of an approved trade label are that it bear the true name of the article contained in the package, that it bear the phrase "U. S. Inspected and Passed by Department of Aguculture" and the official number of the establishment (unless the establishment number appears otherwise, as by embossing upon metal containers), and that it bear no statement. word, picture, or design that is false or decep-

Enforcement of the regulations applying to the truthful marking and labeling of meat foods makes it possible for persons to ascertain for themselves whether their meats are properly inspected and reliably labeled.

Only meat and meat foods which have been inspected and passed by the Federal Government duting every phase of preparation and which are clean and wholesome and bear the inspection mark may be exported to foreign

Inspection of Products.—It is important, under well-ordered meat hygrene, that meat previously inspected and passed at the time of slaughter be further inspected and reinspected as it is cut, chopped, mixed, cooked, cured, canned, or otherwise prepared. Under the United States system these inspections are classed as "Products inspection." It begins with the carcasses, visceia, fats, and other parts immediately as they are passed on post-mortem and continues until the fresh and prepared products are transported from the establishment. The objectives of the products inspection are to enforce the sanitary requirements, guard against the use of adulterants and harms ful substances, require proper marking and labeling, and detect and destroy unwholesome and unfit meat and meat foods.

Materials added to products are examined to see that they contain no prohibited ingredients and otherwise comply with the regulations. Samples of ingredients are frequently referred to the meat inspection laboratories for chemical

or other technical examination.

Imported Meats and Meat Food Products. -The regulations governing the admission of meat and meat food products from foreign countries require that every importation shall be accompanied with a certificate signed by an official of the national government of the country of origin stating that the animals from which the meat or meat food product was derived received an ante-mortem and a postmortem veterinary inspection, and that at the time of slaughter and upon subsequent inspections the meats and products were sound, healthful, wholesome and otherwise fit for human food; further, that they had not been treated with and contain no ingredient prohibited by the regulations of the United States Department of Agriculture. Meat or meat food products not accompanied with the required certificate is refused entry, and that from a country which does not mainfain a system of meat inspection satisfactory to the Secretary

of Agriculture is also refused.

Upon arrival every consignment of imported meat or product is checked with the foreign inspection certificate and is subjected to a thorough physical examination, and in most cases samples thereof undergo a laboratory examination. The meat or product is their admitted, refused entry or condemned according to the fadings.

findings

Statistics.—The Federal system of meat inspection reaches about two-thirds the total number of food animals stanglitered in the United States and all imported meat. As previously stated, the remaining third is not subject to Federal control because of its intrastate origin and distribution. Much of the latter supply, it is known, receives no adequate inspection. The number of establishments at which in-

The number of establishments at which inspection is regularly maintained varies somewhat; however for several years it has approximated 750. The total number of food animals given both the ante-morten and post-morten inspection is approximately 70,000,000 annually. The average proportion of whole carcasses of such animals condemned is less than half of one per cent, while the number of parts of carcasses condemned in recent years has been less than 1.5 per cent.

The cost of inspection in the average year, including administrative, laboratory, and all other expenses, is less than 7 cents for each animal slaughtered. In terms of dressed meat and resulting meat tood products the cost is less than one twenty-fifth of a cent a pound.

and resulting ment food products the cost is less than one twenty-fifth of a cent a pound References.—Joss, E. C 'National Meat Inspection in the United States of America' (In proceedings of Twelfth International Veterinary Congress), 1934 Mohler, John R. 'The Inspection Stamp as a Guide to Wholesome Meat' (Miscellaneous Cucular No. 63, United States Department of Agriculture, 1926) Ditewig, George "The Meat-Inspection Service of the United States Department of Agriculture" (In the Yearbook for 1916 of the Department of Agriculture).

- JOHN R. MOHLER, Chief Bureau of Animal Industry, United States Department of Agriculture.

MEAT, Market Classes and Grades. The kinds of meat considered in this article are beef, veal, pork, mutton and lamb. Each kind is classified according to certain general distinctions, such as the sex of the carcass or the part from which the cut is taken. The classes, in turn, are graded with respect to quality, covering, weight or other factors which determine the value of the individual cut or carcass.

Beef.

Beef products are marketed either chilled, frozen or cured. Fresh chilled and fresh frozen beef include the carcasses, quarters and the various commercial cuts of beef. Cured beef includes pickled or corned beef, dried or smoked beef and canned beef. About one-half of the fresh beef sold on wholesale markets consists of carcass beef. (The carcass is split into halves or sides; cach side in turn is divided into fore and hind quarters). The rest is sold in the form of commercial cuts such as ribs, loins, rounds, chucks, plates, briskets, flanks, shanks and suet. «Block» beef refers to all side beef which is sufficiently thick fleshed and fat to be sold readily over the butcher's block. «Cutters» are the carcasses of thinly fleshed or poorly finished cattle from which only certain commercial cuts such as loins and ribs are suitable for block purposes, the other

portions being adapted only to conversion into boncless cuts and cured meat products «Canners» are those carcasses of beef no portion of which is suitable for block purposes. Such carcasses generally are divided into smaller cuts, such as boncless fresh meats, sausage trimmings,

canned and cured beef products

Classes and Grades of Carcass Beef .-The classes of carcass beef are steers, heifers, cows, bulls and stags This classification is based not merely upon difference in sex, but also upon the general uses to which the dif-ferent classes are adapted. Steer carcasses are identified by the cod fat and generally by their full, fleshy rounds and loins, heavier, coarser bones and short, thick necks as compared with cows. They show more quality and finish and are sold as carcass beef more extensively than any other class. The grades are prime, choice, good, medium and common llerfer carcasses are distinguished from steers by the udder which also should show no evidence of lactation or a development of the sinuses usual in the udders of cows. As a rule they have smaller bones, slightly more angular rumps, less development of lean flesh and are of an average lighter weight than steers. The grades are prime, choice, good, medium and common. The angular form, long neck, hard white bones, more cavernous interior and lack of thickness of the flesh of the majority of cow carcasses make them easy to distinguish from other classes of beef. The vertebræ do not split as smoothly as in heifers or young steers The flesh is seldom as well marbled by fat deposits between the muscle structure as in heifer or steer carcasses. A large percentage of the carcasses of this class are cutters and canners with a correspondingly smaller proportion suitable for «block beef.» The grades are choice, good, medium, common and canners

Dressed bulls are easily recognized by the short and thickly muscled, prominent neck, heavy shoulders, thick rounds, dark and coarsegrained flesh and the absence of cod fat. Rough conformation and hard bones are also common characteristics of bull sides. Many stags approach steers in form, quality and finish, while others are difficult to distinguish from bulls "Yearlings" are carcasses of young steers and heifers with sufficient quality and finish to be used as block beef. "Butcher" cattle, as the term is applied to carcass beef, are those which are suited to the cheaper «butcher shop» trade. They include the medium and common grades of all classes of beef cattles. «Kosher» cattle are dressed beeves that have been slaughtered, inspected, cleansed and labeled in accordance with Jewish rites; «Kosher» being the Hebrew word for «clean» They include all classes and grades of beef cattle. «Distillers» are steers, bulls and stags cattle. «Distillers» are steers, that have been fed on distillery wastes and have soft, "puffy," "washy" flesh together with the "high color" that is characteristic of cattle fattened on such feed.

Beef Cuts.—Beef cuts are sold both as «straight cuts» and as subdivisions thereof. The method of dividing carcasses into cuts differs, in the various cities and sections of the country. The straight cuts handled in Chicago markets are loins, ribs, rounds, chucks, plates, flanks and shanks. The standard grades of straight cuts are No. 1, No. 2 and No 3, accord-

ing to their weight, quality and thickness Cuts that are too deficient in thickness and quality to be used on the butcher's block, and which consequently are made into boneless cuts, cured beef products, sausage, etc, are called «strippers »

Cured Beef Products.—The plates, flanks and rumps of all grades of cattle are, at times, used in making cured beef, and in the lower grades of beef the rounds and chucks are quite commonly cut up and cured before marketing. Barreled or corned beef is packed in brine The standard barreled beef products are extra India mess beef, extra plate or extra family beef, regular plate or family beef, packet beef, common plate beef, rolled boneless beef, prime mess beef, extra mess beef, rump butt beef, mess chuck beef, beef hams and Scotch but-Smoked or dried beef consists almost entirely of beef hams, made from the rounds which, after curing in sweet pickle, are dried and smoked Canned beef is hermetically sealed in tins or glass jars, usually after curing and processing. It consists principally of chipped beef, beef loaf, corned beef and roast beef. Roast beef is not cured but is cooked and processed in about the same manner as corned beef products.

VEAL.

Calf carcasses weighing less than 300 pounds with comparatively light-colored, fine grained flesh are classed as veal, and the trade is essentially a fresh meat trade. In dressing calves the skin generally is left on in order to preserve the color and moisture of the flesh. The carcasses from heavy or yearling calves are skinned and split and are known as «split veal»

Veal Cuts.—Only 10 to 20 per cent of the

supply of dressed calves are cut up in the whole-sale trade, and this is done largely to supply a few retail markets with choice cuts and to take care of the Kosher trade which uses only the forequarters. The cuts usually made are saddles and racks, both of which grade choice, good, medium and common.

PORK PRODUCTS.

Hog products may be described under two heads: dressed hogs and pork cuts.

Dressed Hogs.—The classification of hog

carcasses is based on the uses to which they are adapted, or the products into which they may be converted. Smooth heavy or heavy loin hogs are prime smooth hogs, either barrows or good, clear (not seedy) sows, weighing 240 to 400 pounds dressed. Butcher or light loin hogs are composed of barrows and smooth, clear sows, weighing from 200 to 220 pounds dressed. Packing hogs include mixed hogs of all weights which are too coarse in quality, rough in shape or soft and uneven in finish to be suitable primarily for fresh pork products or smoked meats, and which therefore are packed principally in such forms as barreled and dry-salt pork. The grading of this class of hogs is based on weight, the grades being heavy, medium and light. Bacon hogs are those which are suitable primarily for sugar-cured breakfast bacon and «English» meats. The hams from this class of hogs are preferred by the trade to the heavier varieties. The grades are choice, good and common and are determined by the degree of quality and finish. «Shippers» are similar to butcher hogs in shape and quality but are lighter in weight and generally are not as highly finished, having only a moderate covering of fat and a comparatively small amount of leaf fat. Pigs are carcasses of light, young swine that are comparatively lean and light-colored in Hesh, with thin, soft skin, soft, red bones, weighing from 20 to 100 pounds

Pork Cuts.—The various cuts made from

diessed hogs may be divided into the following general classes: hams, sides, bellies, backs, loins, shoulders, butts, plates and miscellaneous. These products are reterred to according to the manner in which they are handled, prepared or packed; viz., fresh pork cuts, dry-salt and bacon meats, barreled or plain-pickled pork, sweet-pickled meats, smoked meats, «English» meats and boiled meats. Fresh pork cuts are sold either chilled or frozen. The bulk of the uncured product is disposed of within a few days after slaughter, during which time it is chilled at temperatures slightly above the freezing point Fresh pork cuts are taken more or less from all classes of hogs, but light lon hogs are used more extensively for fresh pork than any other class. The loin is the leading fresh pork cut. Tenderloins and spareribs also are used primarily as fresh cuts Shoulders, plain and skinned, shoulder butts, hams, bellies, fat backs and raw leaf fat are sold fresh to a small extent.

Hams are of two general kinds, short-cut and long-cut. The former are made from comparatively fat, plump hams, trimmed short and round at the butt, with the foot cut off generally above the hock joint. Long-cut hams are lean, long hams, with the butt left full and the foot taken off at the first joint below the hock Sides include various grades and cuts of short ribs, short clears and «English» bacon sides. Short rib sides include regular short ribs, jobbing or rough short ribs, hard short ribs, extra short ribs or "extra ribs," and square cut or «English» short 1 ibs. Short clear sides include regular short clear sides and extra short clear sides or «extra clears.» «English» bacon sides, comprising both the side and shoulder, and in one instance the ham also, include Wiltshire, Cumberland, Dublin, long rib, long clear, Yorkshire and Staffordshire sides.

Bellies include dry-salt, sweet-pickle, breakfast bacon and English bellies. Backs include the short rib backs, short clear backs, short fat backs and long fat backs. Loins consisting of the back with the fat trimmed off are sold either as regular pork loins or as loin rolls.

The standard grades of shoulders are rough, regular, picnic, New York style, skinned, square, New Orleans style and boneless rolled shoulders. Shoulder butts are cut from muscular parts of the ends of tops of the shoulders. Joyl butts are made from the joyl shoulders. Jowl butts are made from the jowl (neck and face). The various grades of (neck and face). The various grades of shoulder butts are boneless Boston style, Mil-waukee style, Buffalo style, New York style, picnic, dry-salt and square-cut butts. Plates are made from the heavy fat which covers the ends or tops of the shoulders. They are known to the trade as regular plates and clear plates. The so-called back plates are made from fat

Miscellaneous Cuts. — The miscellaneous cuts of pork may be grouped as mess pork, belly pork, shoulder pork, spareribs and trimmings. Mess pork includes regular mess pork

Weight -

Pounds

light mess pork, prime mess pork, extra clear pork and loin clear pork Belly pork includes regular belly pork, brisket pork and rib and regular belly pork Back pork includes regular back pork (short cut mess of family back pork), clear back pork, tat back and short cut clear pork and ham butt pork (lom end or rump pork)

Shoulder pork consists of extra prime pork and Boston style butt pork Bean pork or clearbutt pork is made from the jowl Spareribs are termed «full-sheet,» «half-sheet» and «backhone" spare 11bs Neck bones including the shoulder ribs come within this general class Trimmings are of two grades special lean or «A» and regular or «B» grade. The standard grades of lard are kettle tendered, neutral. prime steam, refined and compound lard. They differ as to the kinds of fats from which they are made, methods of tendering, color, flavor and grain Lard compounds are composed of a mixture of pork fats with other animal or vegetable fats or oils. Laid substitutes or vegetable shortening contain no pork fats or oils, being composed wholly of vegetable fats, or of vegetable fats with beef fats added.

MUTTON AND LAMB

Mutton and lamb are sold almost entirely in a fresh or frozen state. The bulk of supplies, except those frozen, are disposed of within a week or 10 days after slaughter. Approximately two-thirds to three-fourths of the wholesale supply of mutton and lamb consists of lamb.

Mutton Cuts.—About one-half the supply

of dressed wethers, ewes and yearlings in large wholesale markets is sold as mutton cuts. two major cuts are known as racks or fores and saddles or hinds The racks are made into The short rack includes stews and short racks two-fifths and the stew three-fifths the weight of the rack. The cuts derived from the saddle are the leg and the loin.

The grades of mutton cuts are choice, good, Cuts of these grades medium and common. correspond in shape, quality, covering and relative weight to the same grades of carcass mutton

Lamb Cuts.—Lambs are more largely sold in the carcass than sheep. It is estimated that one-fourth to one-third of the wholesale lamb trade consists of cuts. The methods of cutting and the proportions of the various cuts are identical with those of mutton. The grading of lamb cuts also is similar in general to that of mutton cuts.

RETAIL CUTS OF MEAT.

Retail cuts of meat are classified according to several different standards. Some are satisfied to group them simply as tender and tough meats. Others grade the different cuts as nrst, second, third and fourth quality, according to Others grade the different cuts as first, their degree of general excellence. Likewise, taking the market nice as a basis, the classes may be designated as high, medium or low priced, as the case may be. The location of the cuts in the carcass is another means of fixing their names in mind, learning them in consecutive order from neck to hind shank. Aside from the quality consideration involved in selecting retail cuts of meats, the selections are influenced chiefly by the following:

The cuts which are best suited to one's cooking facilities
The time and trouble which one desires to take in preparing the meats for the table.

The amount of meat required for the meal or meals in the suiter of the meal or meals in the suiter of the meal or meals in the suiter of the meal or meals in the suiter of the meal or meals in the suiter of the meal or meals in the suiter of the meal or meals in the suiter of the meal or meals in the suiter of the meal or meals in the suiter of

Classifying retail cuts according to the methods of preparation, we have the following general division

- 1 Frying or sauteing.2 Roasting3 Boiling

Frying

4 Stewing 5 Soups and broth.

The purpose for which each retail cut from beef, veal, lamb and mutton, and pork may be used is indicated below. The number of pounds usually found in such cuts is shown by the figures opposite the cuts named

	Porterhouse steak . Club steak Sulom steak Sulom steak Round steak Top round steak . Chuck steak Flank steak Veal steak Pork steak Mutton chops Lamb chops Veal chops Veal cutlets Pork chops Salt pork Fancy breakfast bacon Medium to fat bacon	111 22553422 111 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Roasting.	
	Prime ribs of beef (first cut) Prime ribs of beef (last cut) Shoulder block roast Chuck rib roast Beef rump Beef tenderloin (fillet) Leg of mutton Loin of mutton Shoulder of mutton Loin of lamb Loin of lamb Crown lamb roast Hindquarter (spring lamb) Forequarter (spring lamb) Pork loin Leg of pork Ham (smoked) Poik tenderloin Pork shoulder Spare ribs Veal loin Veal leg (fillet) Veal shoulder Poul Shoulder Veal shoulder Veal shoulder	4 to 18 12 4 to 18 10 12 4 to 18 10 12 4 to to to to to to to to to to to to to
	Boiling:	
5 - 1	Beef horseshoe piece (end round) Beef shoulder clod Rib end of beef Cross-ribs of beef Beef brisket Corned beef, rump, flank, plate or brisket Beef tongue, fresh Beef tongue, smoked Leg of mutton Shoulder of mutton Shoulder of lamb Leg of pork Ham smoked	4 to 8 3 to 6 2 to 5 3 to 8 2 to 5 3 to 8 2 to 5 3 to 6 3 to 4 3 to 12 3 to 8
3	Pork, shoulder, fresh. Pork hocks	3 to 8
7 E	Back-bones and neck bones	1½ to 2½ 2 to 8
e e e e e e e e e e e e e e e e e e e	Stewing Beef plate Boof flank Drop tenderloin Beef skirts Beef neck Beef skin Breast of mutton Breast of lamb Veal breast Veal neck.	3 to 6 2 to 6 1 to 2 1 to 3 2 to 5 2 to 4 1 to 5 1 to 2
	t own moomit to the total to th	

Soup and broth:		Weight — Pounds
Shin soup bones Hind shank soup bones Knuckle soup bones Ox tail Reef neck Beef shoulder clod Beet round Mutton shoulder Mutton neck Mutton shanks	·	1 to 4 1 to 5 3 to 7 1 to 2 1 to 2 1 to 2 1 to 2 1 to 2 1 to 1 2

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MEAT EXTRACT, or juice of meat, has become since its introduction by Liebig (q.v.), a subject of great importance in medicine, dietetics and commerce. The chemical constituents of meat juice are not clearly established, although creatine, sarcine and mosinic acid are among the substances intelligently investigated Phosphoric and hydrochloric acids and inorganic salts, with some coagulable ingredients are among the constituents. Beef tea while of value does not furnish complete food either for sickness or health. Other preparations under this name are now on the market Some are merely the juice of meat pressed out or dried pulverized meat; others are the so-called predigested foods. In the true extract of meat fats and albumens are absent; therefore, while of use as a stimulant, such a preparation is not a true food and cannot take the place of meat in this respect

MEAT INSPECTION ACTS. See Pure Food Acts.

MEAT-PACKING. Meat-packing may appropriately be considered under three heads, namely, preparation and disposal of fresh (unsalted) meats, curing and preservation of meats by salting, smoking and the like, as is usually practised with hog hams, bacon, etc., and preservation of meats by hermetically sealing in tin cans, glass jars, etc., including the final sterilization necessary to complete the process.

Fresh Meats.—The preparation and disposal of fresh meats is perhaps the most important branch of the packing industry and in its development is the newest. Fresh meat has been, of course, an article of commerce from the earliest times; but it is only within recent years that the art of refrigeration has been perfected to an extent enabling fresh meat to be

shipped thousands of miles and its condition and quality so conserved that it is more desirable and palatable after arrival at destination than when first slaughtered. Fresh beef, particularly, is much more juncy and tender if well refrigerated and kept two weeks or more after slaughter. Fresh meats will keep best if held in a temperature slightly above the freezing point, but in practice a temperature of 35° F gives good results, except for long shipments such as from United States ports to Europe, in which cases approximately the freezing point should be maintained, and it may here be observed that lean meat freezes at about 1½° lower temperature than water.

Freezing is slightly injurious to the palatable quality of tresh meat, but by freezing hard and holding at a temperature of 10° F it may be kept without taint for many months. When beeves are in good supply and cheap, the choice cuts, such as ribs and loins, are frozen and held in large quantities until the winter and spring season, when they usually meet with a more favorable market. Fresh pork and mutton are sometimes frozen and carried from season of surplus to season of scarcity, but the volume of this trade in the United States is not great, comparatively. This carrying from the season of over-supply to the season of under-supply by means of freezing has a doubly beneficial effect on the market, increasing the demand for live stock during time of glut, and increasing the supply during the time of scarcity.

The dressed carcasses are, immediately after slaughter, still being suspended from the trolley hooks on which the latter part of the diessing operation is done, run into refrigerated rooms and chilled, usually for two days. The cattle carcasses, and usually the hog carcasses, are split through the back bone into "sides" After chilling, the sides are cut, the beef usually into quarters and the pork into smaller pieces. The quarters of beef are shipped hanging on hooks in refrigerator cars, and the smaller pieces intended for sale fresh are usually boxed and shipped also in refrigerator cars. Mutton and lamb are shipped in the same way, usually in whole carcasses. The refrigerator cars used depend upon ice for their temperatures, and the most successful cars use the ice crushed and with from 6 to 12 per cent of rock salt intermingled

The development of the fresh meat branch of the packing industry received its first important impulse from George II. Hammond, who, in the summer of 1869, began at Hammond, Ind. (a suburb of Chicago), the business of shipping fresh beef in refugerator cars to Boston. first year the business was not successful, but it was courageously continued, the difficulties were gradually overcome, and the second year found it more satisfactory, and the volume amounted to about 600 quarters per week During the following two years this volume was doubled and it continued to grow moderately until, in 1877, Gustavus F. Swift established at the Union Stock Yards, Chicago, a similar business. Under the stimulus of this competition the trade increased rapidly, consignments were made to other cities in New England and New York, other houses entered the trade, and by 1885 it became apparent that this new method of slaughtering cattle near their native pastures and shipping the fresh meat was destined to supersede, largely, the older method of shipping them on

the hoof and slaughtering near the place of consumption. At the present time almost all the fresh beef used in the principal cities east of Chicago, and out of the cattle raising belt, arrives at destination in refrigerator cars. What is true of fresh beef is true also of fresh mut-

ton and pork.

In the early days of the fresh meat branch of the packing industry, it became apparent that new methods of handling and disposal at destination were necessary; obviously, fresh meat could not be received in carloads and disinbuted to the retail dealer, through an ordinary, unreirigerated watchouse, as had been the custom with cured meats. To meet the necessities of the case, refrigerated rooms were built, with systems of overhead tracking, on which quarters of beef and carcasses of small stock were stored and handled, suspended from frolley hooks. In connection with these religerated rooms, or beef coolers, as they came to be known in the trade, there were built suitable shipping rooms. offices, etc. These distributing houses were, as a rule, built adjacent to railroad tracks, enabling the direct discharge of meats from the cars. As the business began to assume some magnitude. it became evident to the packers that great care m the construction, maintenance and operation of these distributing houses was of the utmost importance; it was therefore desirable that a packer own houses for distributing his fresh meat, thus being in position to control, absolutely. conditions of cleanliness and temperature. The earliest fresh-meat packers did not engage in the other branches of meat-packing, but as soon as it became apparent to the older packers, who had previously confined their fresh-meat business to the locality of their packing houses, that the new method of distribution was successful, they began to enter the fresh-meat business aggressively, which in turn forced the pioneers of fresh-meat packing to add the other branches to their business, because a packer having all kinds of meat product to offer to the retailer had an obvious advantage. This diversification caused, m turn, the development of the distributing house, the addition of smoke houses for smoking hams and bacon, store-rooms for canned meats, lard, etc., until to-day the leading packers own, in the principal cities of the country, their distributing houses, where the retailer may obtain any form of animal food-product, including many by-products. There are more than two thousand such houses scattered throughout the United States. This branch house system of distribution, by its economy and thoroughness, and its adaptability to supply a wide variety suited to all the local needs, has been one of the prime factors in the growth of the meat-packing

The beginning of this branch of the packing industry was coincident with the successful application in a large way of refrigeration to railroad cars. The first cars were, however, comparatively crude, and the modern refrigerator car, as used to-day by practically all of the packing companies, has reached its present state of development by a steady growth of improvements made from time to time. This matter of perfection of the refrigerator car has been one in which there has been great rivalry among the various packers, and to this competition is due the high efficiency of the present refrigerator car for carrying fresh meat. The

building, maintenance and care of these refrigerator cars is the field of one of the most important departments in connection with the various packing companies The cars must not only be kept in first-class running order so as to make them suitable for operating on fast trains, but they must be kept in a high state of cleanliness The icing of the cars is also a very important feature and has to be done with the utmost care. Before loading, the cars must be iced at least 24 hours in advance, so as to be thoroughly cooled They are then re-iced at the time of shipment and are re-iced in transit as necessary, depending upon the length of the journey Immediately after unloading, the car is scrubbed with soap and hot water, all hooks are wiped clean and the car is ventilated so that it will return home in a sweet, clean condition.

Curing and Preservation by Salting, Smoking, etc.—The preservation of meat by salting, smoking, etc., was the first method extensively practised, and the term "packing," now applied to the whole business, formerly had a narrower meaning and was used in connection with this branch exclusively. In fact this was,

in the early days, the only branch

From the earliest times meats have been cured by salting and smoking and in principle there is nothing essentially different in the practice of the modern packing plant from the curing processes used by the packers of earliest days. The business is now conducted on a much larger scale, and with more care as to conditions, particularly as to refrigeration and sterilization, so that meats are now cured with less salt than formerly, or to use the trade expression, mild cured.

The two methods of curing with salt are known as "pickling" and "dry salting," and these terms are relatively descriptive In pickling, the meat, after being cut into hams, shoulders, etc., is submerged in pickle or brine and kept under the surface with weights or other devices, so the salt in the pickle is diffused through the meat This causes the strength of the pickle to decline and the meat must occasionally be removed, and placed in a fresh hogshead with restrengthened pickle. The usual time of cure varies with the size of the joints or pieces of meat, but ranges usually between 30 and 45 days. The pickle is made of various strengths for various cuts of meats, but is generally 40° to 50° salometer. and for hams, bacon and the finer cuts of meat contains sugar as well as salt and a small percentage of saltpetre Meats for consumption in the United States are generally cured in sweet pickle.

The process of dry-salting is to pile the joints or cuts of meat closely in layers on the curing floor, first rubbing them thoroughly with salt, and sprinkling salt freely between the layers and on top. The piles are made three or more feet in height, and the meat is left for 10 days, when it is overhauled, rubbed again with salt and repiled; and this overhauling is repeated again in another 10 days. The time necessary for the curing by the dry-salt method is substantially the same as by the pickling method. The dry-salting method is used for most meats for exportation to Great Britain, and the method is frequently spoken of as "English cure," being

the standard method in England.

Hams, shoulders, bacon and side meats are, after curing, generally smoked. The process of smoking is also quite old and its origin unknown. The meats are hung in brick houses or compartments in tiers, as closely together as practicable without touching, a slow fire of wood is built beneath, and the meats kept in the resulting smoke for 12 to 48 hours. They are then cooled, wrapped, boxed and made ready for shipment. Hams and bacon, also shoulders, generally have a brand burned in the skin before wrapping. For shipment to hot climates the pieces, after wrapping in paper, are also "canvased," or sewn up in cotton sheeting, and coated with a thick pasty solution of China clay, barytes or the like, and then dried. This forms an air-tight, vermin-proof covering. Hickory and sugar maple are the best woods for smoking.

The preceding paragraphs relating to the curing of meats by salting, smoking, etc., describe the process as applied to meats of the hog. Beef is cured in like manner by picking and is generally shipped to destination and kept in the pickle until removed for consumption. An exception is "dried beef," being the suitable lean pieces, which, after curing in pickle, are smoked slowly for several days so as to dry

them to a firm condition.

Preservation by Hermetically Sealed Cans, etc.— The method of preserving meat by packing in hermetically sealed tin cans and the like was introduced commercially into the United States about the year 1873 at Chicago, Ill, by William Wilson and John Wilson. In the following year Libby, McNeil and Libby also entered this trade, and during succeeding years other houses followed. The business grew rapidly from the beginning, and has reached great

magnitude.

The process in brief is as follows: The meat after being trimmed from the bones and cut into small pieces is put into a curing pickle composed of common salt and a little sugar in solution. It is left in this pickle any length of time from a few days to 20 days, depending upon the degree of saltiness desired. It is then taken out of the pickle and cooked in hot water until thoroughly done. After this the gristle is trimmed out, the surplus fat is removed, and the pieces are cut into small and comparatively even sized bits, usually not exceeding four cubic inches. In this condition, and while still hot, it is stuffed by an automatic machine into tin cans which have previously been prepared and thoroughly washed. Each can is then weighed so as to get the correct quantity of meat in it, and is "capped," that is, a small tin disc is soldered over the hole through which the meat is introduced into the can. The further steps of the process embrace the sterilization, or so-called "processing," which consists in heating the cans for a number of hours up to a tempera-ture of 250° to 350° F., depending upon the size of the can and the kind of meat. The object in heating is sterilization, being the same process as is pursued by the housewife in canning fruit, etc. The cans are then washed, cooled, labeled and the exposed surfaces are coated with a varnish to prevent rust. They are then ready to be packed and shipped to all parts of the world,

and will keep for years without deterioration.

By-products.— The business of meat packing as practised in Chicago and the other large

packing centres of the United States involves not alone meat preserving, but the entire range of slaughtering, preparation of the fleshy and other edible parts, and preparation of the byproducts, such as hides, hoofs, horns, bones, hair, fats, intestines, blood and viscera. In many of the most prominent establishments these by-products are manufactured into glue, buttons, combs, curled hair, soap, candles, oils, glycerin, etc. All the modern establishments manufacture the blood and residual solids from their fat rendering apparatus into fertilizers, in some cases the blood-albumen being first separated and dried independently.

The accompanying diagram will illustrate graphically the disposition usually made of the

different parts of beef cattle

Corresponding parts of other animals are put to similar uses. The stomachs of hogs are utilized for pepsin manufacture. Some of the glands of hogs, sheep and cattle, notably the thyroid and pancreatic, are used in the production of pharmaceutical preparations. Sheep skins first have the wool pulled from them and are then utilized for leather, the cuttings being made into glue. Hog hair and bristles are made into curled hair and brushes. Curled hair is sold for mattress making. All scraps and parts, not put to some other important use, are cooked, desiccated and used in many valuable products and as fertilizing material, the chief property of which is nitrogen.

General.—By the careful study of economy mutilization of by-products large values are now derived from parts formerly wasted. Today there is practically nothing wasted. This close study of economy in saving everything enables the packing business to be done on an imprecedently small margin of profit. For a series of years, including 1915, the fiscal reports, made by some of the largest and most successful packing corporations to their stockholders, show that their profits ranged from 2 to 2½ per cent of their distributive sales.

It must occur to all thoughtful persons that in a business of such large volume the securing of steady and sufficient supplies of fat animals is of prime importance, and the query naturally comes as to how this is done. Almost the entire supply of live stock is purchased from day to day, as needed by the various packing companies, at central markets in the large cities, such as the Union Stock Yards of Chicago, Kansas City Stock Yards of Kansas City, National Stock Yards of Fast Saint Louis, South Omaha, Neb, South Saint Joseph, Mo, South Saint Paul, Minn., National Stock Yards, Ill, Fort Worth, Tex., Sioux City, Iowa, Oklahoma City, Okla., Denver, Colo., Milwaukee, Wis. These stock yards are equipped to receive live stock in train loads — unload, pen, feed, water, and otherwise care for the comfort and health of the animals.

Live stock raisers most frequently sell their animals at home to a dealer, who, in turn, consigns to a commission salesman at some central market, where the buyers for the various packing companies meet in competition and bid for each lot or carload. The bidding is not by public outcry or auction, but by each buyer independently. There is no public system of grading, but each purchase is made on individual inspection and judgment of the buyer and salesman.

The development of these stock yards has

1	Beer	Hindquarters Forequarters				
	TAII			Edible Edible		
	SWEETBREAD KIDNEYS	Not separated from	n hindquarters			
	HEAD	Tongue Ment Brain	Edible			
		Bones	{ Glue Phosphatic fertil	zing material or raw bone meal		
		Horns	Cuttings Pot	Ornaments, etc , assium, ferrocyanide or rogenous fertilizing material		
		Horn piths	{ Glue { Steamed bone			
		Tallow	(June 1 June 1	Combs Buttons etc		
		· ſ	White and striped Combs, Buttons, etc. Potassium ferrocyanide of Cuttings Nitrogenous fertilizing r			
		Hoofs	Black and inferio	or { Potassium ferrocyanide or { Nitrogenous fertilizing material		
	7	Neatstoot Oil	(Buttons, Handles, etc		
	FEET (Including legiter) from knee down-	Bones	Shin	Cuttings { Gelatine Phosphatic fertilizing material		
	ward)	120000	Joint and Toe	Glue or raw		
		Sinews	Glue Grease Nitrogenous fert	((5010 11001		
		(Leather				
	Hide	Hair	{ Body nair {]	Plasterers' hair Tair felt		
		}	(Long nair of the	tail — curled bair		
BOVINE {		Pate Leg and Tail Trimmings	Glue Grease Nitrogenous fert	alizing material		
1	BLOOD	Blood Albumen Food for animals, particularly for calves Nitrogenous fertilizing material				
		Heart Liver	} Edible			
		Stomach	{ Tallow Tripe			
		Respiratory Orga Melt		animal food s fertilizing ma-		
	Viscera	Entrails	{ Grease Sausage casings			
		Bladder	Is inflated with dried and is us paints, putty,	compressed air, sed for containing etc		
		Gall	Sac — Fertilizin Fluid — Desicce purposes	g material ted for medicinal		
		Weasand	Meat dried for p	poultry food		
		Oleo Oil	Combined with into butter su	other ingredients bstitute		
	CAUL AND INTERIOR	Oleo-Stearine	Combined with into lard subs	other ingredients		
	L'AL	Tallow and Grea	se { Oil Glycerin Soap Candles			

kept pace with the growth of the packing industry. Indeed, these large central markets for live stock and the packing plants are interdependent and mutually helpful. Together they constitute one of the modern wonders of our commercial development. The benefits to the raiser of live stock, the live stock dealer, the transportation companies, the retail dealer, and to the consumer, of an organized business that affords the producer an every-day cash market for any number of animals, the carrier a reliable and steady freight volume, and the retailerand through him the consumer - a constant supply of the widest variety of kind and quality of animal food products, can hardly be exaggerated. To appreciate these benefits, let the reader try to imagine a return to the conditions of a generation ago. Within the memory of many still engaged in the business, the farmer had only a local and very uncertain market for his live stock He could sell in limited numbers, must find his customer by inquiry and frequently had to wait for weeks after his stock was ready and ripe for slaughter The butcher also depended on local supply, and must needs ride through the countryside and inquire, and frequently felt compelled to buy and use stock of a quality not suited to the demands of his business. He had to drive the animals to his little, unsanitary abattor, slaughter them himself in the cool hours of the night, and hurry the sale of the fresh meat before incipient decomposition He was constantly oversupplied or undersupplied, had too much of one grade and too little of another, and so frequently met with losses that his margin of profit must needs be large. The consumer, of course, could fare but ill under these conditions. He might whet his appetite with the thoughts of a juicy porterhouse or a prime rib roast, and find his butcher could furnish only veal or pork chops, and was compelled constantly to choose from a nairow and unastractive variety, and to pay an excessive price. Values were unstable and varied greatly, and producer, dealer and consumer alike suffered.

To-day the modern packing-house, with the central market for live stock which it has built upon one hand, and its system of refrigeration and distribution on the other hand, brings the producer and consumer into such near touch that the one can market his animals in any numbers any day, and the other can buy in any town or village of the country having railroad connections, any desired quantity and quality of so wide a variety of animal food products that his slightest whim or necessity can be satisfied.

This bringing together of the producer and the consumer the modern packer, with the aid of our railroads, stock yards and refrigeration, has accomplished, to the enormous benefit of both; and to-day the actual producer gets a much larger part of the total price paid by the actual consumer than ever before Investigation by the United States Department of Agriculture showed that the producer received about two-thirds of the price paid by the consumer for meat and by-products

In this age of engineering and mechanical advancement, the use of machinery has, of course, played a prominent part in the development of the business of meat-packing. The modern packing plant is divided into many departments, so related with reference to each

other that the whole, in reality, constitutes a vast machine. The invention and perfection of machines to do the various kinds of work has been given a great deal of attention, and the practical men in connection with the different packing companies have vied with each other so that improvement has followed improvement in many cases one machine being improved by another before fairly having the newness worn off. To-day, in the most up-to-date packing plants, the vast majority of the operations carned on are done by machines Such plants are operated entirely by electric power, are lighted by electricity, supplied with water by electric pumps, refrigerated with cold brine circulated by electric pumps, and in some cases even the live animals themselves are horsted from the ground to the top floor of the slaughter-house by enormous electric elevators, carrying a car-load at a time. They are hoisted by means of electrically-driven horsts Hogs are scalded, scraped, cleaned and delivered to the chillrooms by machinery, hand work being reduced to less than half what it formerly was. meats are cut by machinery, also sprinkled and rubbed with salt and packed Hams are branded by machinery, and are carried by mechanical means to the loading platforms, ready to go into the cars

In the handling of by-products, various machines do all of the most important work. Fertilizing materials are cooked, pressed, dried ground, sifted and packed in bags and weighed by machines. Bones are dired, sawn, made into knife handles, buttons, crochet hooks, etc. largely by automatic machinery. Glue is evaporated, jelly sliced, jaired, broken, ground, bolted and packed into barrels by machinery Soap is cut into bars, stamped, wrapped, packed into boxes, and the boxes nailed and printed by machinery. Soap powder is mixed, ground, sifted, packed into cartons, labeled, pasted and delivered to the boxes by machinery. So on, throughout the various departments, great attention has been given to the introduction and perfection of machines, so that the modern packing plant, volume considered, uses no more than half the hand labor that would have been required 20 years ago to do the same amount and variety of work.

The packing business is one of the largest industries in the United States in the value of its output, which amounts to more than \$3,350,000,000 annually. There are more than 1,200 establishments engaged in its activities and more than 121,000 persons employed. It returns to the producers of raw material over three-fourths of the total value of the products.

Argentina is also an important meat packing country, its leading industry being meat refrigeration. One of the largest refrigerating plants in the world, with a daily capacity of 5,000 cattle and 10,000 sheep is situated in Buenos Aires. Uruguay, too, has several very large refrigerating plants and animals and animal products constitute about 95 per cent of that country's exports Australia exports great quantities of meat averaging more than \$30,000,000 in value annually. The country is capable of a large increase in cattle and sheep raising and future years will undoubtedly see a greatly enlarged production Since the beginning of the century South Africa has begun to develop her meat production resources.

The packing business is notable for furnishing a spot cash market for any quantity of live stock that the producer chooses to send to the market It is notable for its ability to distribute products of live stock throughout the world. where the demand is greatest, for the enormous volume of business done by the large firms and for their very small margin of profit per cent of sales.

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MEATS AND MEAT PRODUCTION. The discussion of the subject will be confined to a consideration of the properties, use and production of the flesh of cattle, sheep and swine for human food. All animal fissues are made up of dry substance, or solid material, and water. The per cent of water in meats varies from 10 to 78. The two things which appear to have the greatest influence upon the percentage of water in meat are the age and condition, or degree of latness, of the animal Other things being equal, the younger the animal the more water its flesh as well as other tissues contains, while the higher the percentage of fat in meat the lower the percentage of water The extreme variation in the water content of different cuts and varieties of meats is due largely to an extreme variation in fat content Thus all lean meat consists approximately of 75 per cent of water and 25 per cent of solid material. While the water in meats aids in their digestion and absorption in the alimentary tract, the nutritive value of meats rests largely on the quantity and character of the dry sub-stance or solid material they contain. From 50 to 65 per cent of the fat steer is meat In ether words, the diessed carcass of a steer represents from 50 to 65 per cent of the weight of the live animal. The remainder is made up of by-products, in general, such as hides, fat, offal, ctc., less valuable than beef. A physical examination of meats shows them to be made up of muscular tissue or lean meat, fatty tissue or fats, cartilaginous tissue or the gristle, and bone. From the standpoint of the nutritive value of meat, gristle and bone are practically

Composition.—Chemically, meat is composed of protein, fats, water, ash and carbohydrates, which are the necessary food constituents for the production of energy and repair of the animal body. The amount of carbo-hydrates is so small as to make it almost a negligible factor. Extractives are also present in meats which are betieved to be responsible for meat flavors. While differences in the While differences in the chemical composition of two cuts of meat are not necessarily an indication of their relative food value, yet the composition of meats in general is important as indicating their place in the diet of man. Lean meat contains from 15 to 21 per cent protein; whole eggs, 12.5 per cent; fresh, whole milk, 3.4, and cheese from 25 to 30 per cent. Fresh vegetables, other than peas and beans, contain 05 to 3 per cent protein; fresh peas and beans, 2 to 7 per cent; wheat flour, 10 to 12 per cent; and dry peas and beans, 18 to 25 per cent.

Thus it will be seen that meat contains a relatively high per cent of protein as compared with other staple foods. The mineral matter comprising the ash of meats is made up chiefly

of potassium phosphate, with small amounts of magnesium, sodium, calcium, phosphates and chlorides. The percentage of ash in fresh edible meats varies from 05 to 15 per cent. The organic extractives of meat consist mainly of creatine, certain basic nitrogenous substances including the purme bases, and small amounts of lactic acid, glycogen or animal starch and glucose in traces. Glycogen and glucose are the only carbohydrates in meat and occur normally in very small quanti-The percentage of organic extractives in meat varies widely with the kind of meat and the location of the cut, from 07 to 2 or 3 per

Dietetic Value.— Meat is a staple food in the American dietary, chiefly as a source of protein and fat. In the average American dietary, 28 per cent of the protein and 58 per cent of the fat is represented by the consumption of meat from cattle, sheep and swine. Protem is essential for the growth and repair of body tissue, and while the actual bodily requitement for protein may be relatively small, it seems probable that a fairly liberal protein intake is essential for optimum conditions of health and vigor Meat is an especially satisfactory source of protein in the diet, first, because it is so readily and completely digestible as compared with the vegetable proteins, and, second, because it is better adapted to the body's requirements and thus possesses a higher physiological value Illustrative of the latter point, in a recent experiment on a human subject it was shown that the following minimal amounts of the various proteins indicated were required to cover the protein requirements of the body and to protect body protein from loss:

Meat protein					30	grams	per day
Mılk "					31	"	- 4
Rice "					34	"	а
Potato "		•	. • •		38	u	и
Bean "				• •	54	и	u
Bread "	٠.	• •	•••		76	и	u
Corn "		•	• • •	• •	102	u	u

The value of meat as a food is also enhanced by its content of organic extractives. These substances are among the water-soluble constituents of meat and give to meat its characteristic flavor. Thus, it may be shown that the greater palatability of the higher priced cuts of beef is associated with a higher percentage of organic extractives in the lean meat While the organic extractives have practically no food value, as the term is ordinarily used, yielding but little energy or structural material to the body, they are known to be potent in stimulating the digestive glands, especially the gastric glands, and thus probably play an important iôle in digestion.

From one-tenth to one-third the cost of food in the average family is paid out for meats. Some facts are given therefore which throw some light on the question as to the desirable qualities of beef Beef is used to illustrate the matter of quality because it is pre-eminently the most popular flesh food and because quality means more in beef than in mutton or pork, especially the latter. If all the desirable qualities of beef could be secured in one cut it would be palatable, nutritious and economical. This is practically impossible, however; there are wider differences in cuts of meat as to palatability and cost than as to food value, while the less ex-

pensive cuts may be rendered more palatable by proper methods of cooking Palatability of beef depends upon tenderness, juiciness, quality and flavor. Tenderness, juiciness, quality and flavor depend upon the age of the animal, the location of the cut, the condition of the animal as to ripeness, the degree of ripeness of the meat and the method of cooking. As a rule the younger the animal the more tender the meat Perhaps nothing, however, has more influence upon tenderness than cooking,—different cuts requiring different treatment. The flesh of young animals invariably lacks that fine marbled appearance, or distribution of fat throughout the muscular tissue that is so characteristic of beef of high quality taken from mature bullocks that are in a finished or well-fatted condition. The beef of young cattle is also more or less lacking in flavor. Satisfactory flavor in beef is of course largely a matter of individual preserence, but a reasonable state of maturity and development is required to give beef its most characteristic It is significant that the more tender flavor cuts of beef, such as the tenderloin, lack noticeably in flavor. Good judges agree that the best flavored beef comes from muscles which are frequently used during the life of the animal. This exercise renders these muscles tougher, but of distinctly higher flavor. Beef cut from cattle of rather advanced age, or for that matter from cattle of any age, is rendered relatively more tender by the ripening process. Fresh beef that has not hung in the cooler for 10 days to two weeks lacks both in tenderness and flavor. Even a longer time in cold storage is desirable with the highest grade of beef. The beef cut from well-lattened steers of good quality or containing a high percentage of beef blood can be much more satisfactorily ripened in cold storage than that cut from mongrel bred steers which have been slaughtered in an indifferent condition Carcasses of prime steers possess a characteristic coating of surface fat which protects the lean beef from too much exposure and gives it an opportunity to fully ripen. In the case of the carcass from the medium and common grades the beef frequently lacks that surface fat which seems to serve such a useful office during the ripening process. Low grade beef will literally rot before it will ripen. Juiciness in beef is largely dependent upon the percentage and distribution of fat, and the method of cooking. While an abundance of fat anywhere on a cut of beef adds materially to its apparent juiciness, an even distribution of fat throughout the muscular tissue, a condition which gives to the meat when carved (especially when cold) that beautifully marbled appearance, is the leading factor in contributing ideal juiciness to the beef. Juiciness may be easily destroyed by too prolonged roasting or broiling. The marbled quality in beef is seldom seen except in reasonably mature well-fatted cattle.

Prime condition in the live animal is essential for producing high quality in beef and other meats as well. In order to secure the highest quality in meats the consumer must pay a relatively high price for the cuts of meat or buy considerably more fat than can be agreeably eaten along with the lean of the cut, thus making it necessary to utilize the superfluous fat for other purposes or consider it as waste or tefuse. In either instance it renders the edible

meat of high quality relatively high priced as compared with low grade meat. On the other hand, meat of high quality need not necessarily be the most expensive for the consumer to purchase, for, when properly cooked, it is so delightfully tender and juicy that all of it is edible, save possibly a small amount of superfluous fat. However, this extra fat is of such quality that it can be readily rendered and used for cooking purposes to supplement or in some instances satisfactorily take the place of more expensive shortening. Another fact which should not be overlooked is that the cheaper, and as generally considered, less palatable cuts taken from a carcass of beef possessing high quality are often fully as desirable as the best cuts from low grade carcasses.

Packing.—The packer or slaughterer of meats is willing to pay a premium for animals in prime or well-fatted condition because when slaughtered they yield a higher percentage of dressed meat, lat, and, in the case of cattle, hides. Not only is this true, but the packer understands that prime condition in the live animal is a strong indication of high quality in the carcass In fact, it may be said that condition is a prime requisite for producing high quality. It has a greater influence undoubtedly than high breeding Again, the packer pays a premium for cattle prime in condition and prime in quality, or good breeding, because in well-bred animals the percentage of high priced cuts is greater than in mongrel or indifferently bred Undoubtedly, the tendency of the meat stock trade for several years has been to concentrate a large part of the slaughtering of the country at leading market centres like Chicago. In other words, gigantic and powerful packing companies have developed from small beginnings until they have within their combined power the ability to practically regulate the market for live cattle, hogs and sheep and meats the world over. Chicago is the greatest live stock and meat market in the world. A large majority of local meat markets in the cities and villages throughout the United States are supplied through the medium of the packing-houses located at our leading livestock markets. Packing-houses can furnish any grade of meat desired For example, in beef they can supply all grades from No 1 to canning stock at prices corresponding with the quality. So economically is the business of the packing-houses administered and so well organized are the various industries growing out of the wholesale slaugh-ter of meats that it is possible for them to sell practically all grades of beef in cities and villages remote from their central plant at prices which successfully compete with local competition. The local purveyor of meats can buy whatever grade of meat he can dispose of to advantage. As a rule in the smaller cities and villages the retailer buys a medium to low grade carcass, because his trade is not willing to pay prices which of necessity must be paid to secure meat of high quality. It is safe to say that the beef offered at such markets is seldom above No. 2 in grade, no matter whether the market is supplied by packers or local slaughterers

It is impossible to predict the ultimate effect upon the meat trade of the change from local to packing-house slaughtering. On the one hand a packing-house trust can control the price of

live cattle, sheep and swine in such a manner as to reduce, temporarily if not permanently, or in some instances destroy entirely, the profits of the meat producing industry, on the other hand, such a trust can control the price of meat in the carcass to such an extent as seriously to discourage the consumption of meat by raising the price to such a degree that it will become one of the most expensive articles of diet. This power is not likely to be permanently exercised to the disadvantage of the public good, for it should be borne in mind that the very life of the packing business depends upon an active demand for meats by the consuming public. This demand will not exist when prices of meats are too high as compared with other toodstuffs. Producers will cease to prepare livestock for the block when the business becomes clearly unprofitable In other words meat is not an absolutely necessary part of the diet of the masses, nor is the permanency of agriculture dependent upon continuous livestock production.

Production and Consumption.—According to figures supplied by the Department of Agriculture, more meat was produced in the United States in 1926 than during any year covered by the records of the Bureau of Animal Industry, which extend back to 1907. The total output of meat and lard during the year was 19,566,000,000 pounds, or approximately 250,000,000 pounds more than was produced in 1925, although the number of meat animals slaughtered in 1926 was less than the number slaughtered in 1925. The increase in the output of

meat was accounted for by reason of the fact that the animals dressed in 1926 were heavier than those dressed in the preceding year. It is also a fact that more animals were dressed in 1918 than in 1926, but the quantity of meat produced was considerably less in the former than in the latter year, for the same reason that the 1925 production did not equal the 1926 production—the animals were lighter. The following table shows the production of meat in the United States in 1930, and in preceding years:

MEAT PRODUCTION IN THE UNITED STATES
[In millions of pounds—i.e., 000,000 omitted]

Year or	A11		N	Iutton an	d
yearly average	meat *	Beef		Lamb*	Pork
1907-10	15,137	6,895	660	580	6,994
1911-15	14,530	5,924	534	715	7,346
1916-20	16,109	6,693	714	542	8,146
1921-25	17,900	6,791	868	584	9,655
1923	19,105	6.873	870	571	10,788
1924	19.044	7.065	931	589	10,456
1925	17,960	7,146	1.001	599	9.210
1926	17,245	7,458	960	643	8,181
1927	16,872	6,826	867	645	8,533
1928	16,955	6,082	814	671	9.387
1929	16,803	6,065	816	690	9,223
1930	16,394	6,076	833	820	8,665

*Exclusive of lard.

Lard production totaled 2,598,000,000 pounds in 1929, as compared with 2,594,000,000 pounds in 1928, 1,897,000,000 pounds yearly average for 1916-20; and 1,582,000,000 pounds yearly average for 1907-10

The following table shows the number of animals slaughtered under Federal inspection during the period 1910-27:

MEAT ANIMALS OF THE PRINCIPAL COUNTRIES OF THE WORLD

COUNTRY	Cattle	Swine	Sheep	Goats
United States (1927)¹ Argentina (1922) Australia (1924) Austria (1923) Belgium (1925) Brazil (1920) Bolivia (1925) Bulgaria (1920) Canada (1925) Czechoslovakia (1926) Denmark (1926) Estonia (1926) Finland (1925) France (1925) Germany (1926) Germany (1926) Gerece (1925) Hungary (1926) India, British (1925)² Italy (1918) Japan (1923) Jugoslavia (1925) Latvia (1925) Lithuania (1925) Remos (1924) Norway (1925) Poland (1921) Norway (1925) Rumania (1925) Rumania (1925) Rumania (1925) Russia (1926) Uruguay (1924) Venezuela (1926) England and Wales (1926)	57,521,000 37,064,850 13,309,473 2,162,346 1,654,767 34,271,324 500,000 1,877,108 9,307,298 2,404,876 2,839,531 5,99,104 1,870,603 14,372,980 17,195,309 550,000 1,847,449 150,952,000 6,239,731 5,371,953 3,795,566 91339,000 100,925 2,187,867 2,062,771 1,150,617 7,894,586 777,904 5,218,950 63,000,000 8,000,000 8,000,000 8,000,000 8,000,000	52,536,000 1,436,638 980,009 1,151,719 16,168,549 1,089,699 4,426,148 1,095,695 3,034,000 333,144 378,383 5,792,860 19,412,489 400,000 2,519,969 2,338,920 667,820 2,802,355 467,100 1,488,000 1,20,928 1,759,600 1,519,245 252,959 5,170,612 1,117,354 3,087,869 20,700,000 3,620,000 5,267,328 1,011,000 635,349 	41,909,000 30,671,841 93,154,953 7,933,437 1,000,000 8,922,604 2,755,556 82,062 235,000 665,971 1,451,084 10,537,020 4,083,934 6,000,000 11,753,910 14,950 7,906,808 1,180,600 14,55,000 14,950 7,906,808 1,180,600 1,455,000 1,528,819 2,178,216 668,211 1,528,819 2,178,216 668,800 1,568,800	5,086,655 250,000 1,331,853 706,214 11,767 1,377,910 3,477,522 3,500,000 30,237,000 30,237,000 30,82,558 1,58,934 1,810,669 10,563 2,865,540 275,783 1,557,743 1,557,743 1,557,743 1,557,743
Sootland (1926) Ireland (1925) South Africa (1925) New Zealand (1926)	1,197,828 4,658,500 9,738,337 3,452,486	145,419 843,912 800,883 472,534	7,203,134 3,297,129 35,569,712 24,904,993	232,018 8,022,857

Animals Slaughtered under Federal Inspection

[In thousands—1 e, 000 omitted]						
Year or						
yearly average	Cattle	Calves	Sheep	Goats	Swine	
				100	26,014	
1910	7,808	2,238	11,408		20,017	
1911	7,619	2,184	14,020	39	34,133	
1912	7,253	2,278	14,979	73	33,053	
1913	6,978	1,902	14,406	76	34,199	
1914	6,757	1,697	14,229	176	32,532	
1915	7.153	1,819	12,212	153	38,381	
1916	8,310	2.367	11.941	199	43,084	
4048	10,350	3,143	9.345	166	33,910	
1010	11,829	3,456	10,320	138	41,214	
4444	11,029		12,691	87	41,812	
1919	10,091	3,969	10,001	42	38,019	
1920	8,609	4,058	10,982		38,982	
1921	7,608	3,808	13,005	12	30,704	
1922	8,678	4,182	10,929	21	43,114	
1923	9,163	4,500	11,529	27	53,334	
1924	9,593	4,935	11,991	33	52,873	
1925	9,853	5.353	12,001	39	43,043	
1926	10,180	5,153	12,961		40,636	
1927	9,520	4,876	12,883	•••	43,633	
	8,467	4,680	13,488	•••	49,795	
			14,000		48,445	
1929	8,324	4,489	14,023	•••	-10,443	

Exports.—According to the United States Department of Commerce, the United States and Argentina supply about three-fourths of the world's ex-trade in meats and fats, while the United Kingdom is the largest consumer of the surplus meat and fat production of the world. For the period 1909-13 the average annual exports of meats and fats from the United States exceeded the exports from Argentina, the next largest country in the non-European group, by about 154,000,000 pounds, and the share of the net export trade of the group was 37 per cent for the United States and 33 per cent for Argentina. Exports from all producing countries except Australia (and New 722) ing countries, except Australia (and New Zealand during the last two years), increased during the World War, but in 1920 a decline set in which was a forerunner of the post-war live-stock depression. This decline continued, so far as the United States exports of beef are concerned, down to and including 1926, so much so that exports and imports of beef are virtually negligible from the United States standpoint. Argentina exports of chilled beef have increased and its markets have extended to include Conand its markets have extended to include Continental countries. Australian frozen beef, however, appears to have lost favor. Exports of meat from the United States reached the highwater mark of 1,662,000,000 pounds (yearly average) for the period 1916–20, passed the billion-pound mark again in 1923 and thereafter dropped to 777,000,000 pounds in 1924; 592,000,000 in 1925, and 407,000,000 pounds in 1929. Imports of meat into the United States attained a mark of 163,000,000 pounds a year for three years during the period between 1911–15. Thereafter they dropped to 33,000,000 pounds in 1923, and rose to 154,000,000 pounds in 1929. Relatively large quantities of beef were exported from the United States during the war, but since 1920 the shipments have averaged considerably less than 1 per cent of the total domestic production. Lard is by far the most important item in American meat production exports. Exports of lard during 1929 represented approximately 33 3 per cent of the production. Approximately 14 per cent of the meat and lard produced in the United States during the produced 2005. in the United States during the years 1925-30 has been exported. The accompanying table is prepared from figures issued by the United States Department of Agriculture:

Per Capita Consumption of Meat.—The per capita consumption of meat of all kinds in the United States was given by the Department

[In milfions of pounds—i.e., 000,000 omitted]

Year	production in U.S.	Ex- ports	Per cent exported	Im- ports	Per cens imported
1914	5,606	93	16	253	4 5
1915 1916	5,779 6,075	387 285	67 47	125 23	2 2
1917	6,641	365	5 5	25 25	•4
1918	7,279	711	9.7	125	1.7
1919 . 1920 .	6,758 6,713	287 155	4 2 2 3	53	8
1921	6.163	52	~.9	43 23	6
1922	6,706	46	.7	32	.4 .5
1923 1924	6,873 7, 065	42 40	6	24	.3
1925	7,146	39	.55	21 17	.3
1926	7 458	38	.55 .5	41	.5
1927 1928	6,826 6,082	34 24	.49	82	1.2
1928	6,082	24 27	.4 .4	121 138	1.9
	0,000	~,	• • •	138	2 09

of Agriculture as a yearly average of 158 9 for the period 1907–10. It dropped to an average of 143 I pounds per year for the period 1911–15, and then rose to an average of 156 2 pounds per year for the period 1916–20. The report for 1930 fixed the consumption that year at 131 7 pounds, exclusive of 138 pounds of lard. The following table shows the per capita consumption of the various kinds of meat in the United States over a period of years:

PER CAPITA CONSUMPTION OF MEAT IN THE UNITED STATES (pounds)

Year or		M	ulton an	ď	
yearly average	\mathbf{Beef}	Veal	1_{amb}	Pork	Lard
190710	73.8	7.3	6.4	71 2	12 0
1911–15	60 4	5 5	74	69 6	11.8
1916-20	60 7	69	5.3	63.8	128
1921-25	61.1	7.9	52	79 5	13 5
1923	61 3	7.8	5.2	85.3	15.3
1924	61.5	8 2	52	85 O	15 4
1925	62.1	8.7	5.2	75.8	10.5
1926	63.4	8.2	5.5	65.7	13.5
1927	58 4	74	54	68 5	13 8
1928	51 7	68	56	73 9	147
1929	51 4	6.8	58	72 8	14 3
1930	50.1	68	6.6	68 2	13.8

Statistics of Industry.—The American livestock and meat industry enjoyed a fairly satisfactory year during 1929. Certain branches of the industry showed Iosses but the gross returns to livestock producers were considerably more than in 1928. Fewer cattle were slaughtered than in 1929 but returns were greater, due to higher prices and increased average weights. The same conditions also obtained in the pork production branch, the number of hogs slaughtered being less, but the prices received being greater. Sheep producers marketed an increased number of animals in 1929 and this increase was also accompanied by an increase in money received. There was a greater demand for lamb and mutton, due perhaps to the high cost of beef.

The value of the products of the meat-packing industry during 1929 exceeded \$3,390,000,000, according to a report on the slaughtering and meat-packing industry by the Bureau of the Census, issued in the early part of 1930 From this report the following table is taken:

SUMMARY FOR THE MEAT INDUSTRY

DOMESTICE FOR II	TIP TATTOLIT TIAL	DOSINI
	1925	1929
Number of establishments.	1,269	1,244
Wage-earners (average number)	120,422	121,246
Maximum month	Tan. 131,970	••••
Minimum month Per cent of maximum.	Apr. 113,193 85.8	••••
Wages	\$159,355,189	\$1 64,487,568
ing fuel, electric power, and containers)	\$2,625,192,435 \$3,050,286,291	\$2,938,028,285 \$3,394,672,995
Value added by manufac- ture	\$425,093,856 441,516	\$456,644,710

MEATH, meth, Ene, county in the province of Lemster, with an area of 577,821 acres It is bounded by the countres of Louth, Monaghan, Cavan, Westmeath, Ottaly, Kildare, and Dublin and by the Irish Sea The county town is Trun. and the main rivers are the Blackwater and the Boyne. The Royal Canal passes near the southem border Most of the land is very fertile, being favorable for the principal crops which are potatoes, turings, and outs. The chief occupations, in addition to farming, are textilemaking and stock raising. There is no good haibor despite the seacoast, although the rivers provide both front and salmon Meath was made a county during the time of Edward I, but its boundaries were not fixed until much later. Two of the noted landmarks are the ancient round towers at Kells and Donaghmore. The royal palace at Tara, the monasteries of Duncek and Clonard, and the tort at Trun are other distinguished relies of the section's long listory. Pop. (1943) 65,298 Consult Healy, John, History of the Diocese of Meath (Dublin 1998) 1908).

MEAUX, mō, France, a town in the department of Seine et Maine, located 28 miles northeast of Paris, on the right bank of the Maine River. It is famous for its beautiful setting and many notable church bindings and eastles. Meaux has been the seat of a bishopire since 375 a.d. The Cathedral of St. Etienne, built from the 12th to the 16th centuries, contains the tomb of Jacques Bossuet (q.v.), bishop of Meaux and a renowned orator. The ancient episcopal palace dates from the 13th to the 16th centuries. The town has been in existence since Roman days when it was the capital of the Gallic tribe of Meldi. It was besieged in the 15th century by Henry V of England and became the first Protestant town in France. During World War I it suffered from the German drive toward Paris, although the enemy was stopped here and turned back to the Aisne. Again in World War II it became the scene of fighting and was occupied by Germany until the liberation of France in 1944. Pop. (1936) 14,028

MEBANE, North Carolina, a village located in both Alamance and Orange counties, altitude 678 feet, situated 23 miles northwest of Durham, and served by the Southern Railway. Founded in 1851 by Frank Mebane, it became an industrial and tobacco market town and the trade center for a large farm area. In addition to having the oldest furniture factory in North Carolina, its other manufactured goods include mattresses, bedsprings, and cotton yarns. The annual Six-County Fair is held each fall at Mebane. Pop. (1940) 2,060.

MECCA, mčk'a (Arab. Makkah), Saudi Arabia, the holiest city of Islam, capital of the territory of Hejaz, located about 45 miles east of its Red Sea port Jidda with which it is connected by road. The Mohammedans called the city Umm-al-kora, meaning "Mother of Crics," deriving its sanctity from having been the birth-place of Mohammed. Mecca is situated in a narrow, sandy valley, enclosed by barren hills from 200 to 500 feet high Jabal Khandama, with a height of about 3,000 feet, is located nearby. After heavy rains the water flows down from

the hills into the city, often filling the streets with water

Ancient walls baired the valley at only three points where gates led into the city. Its early importance came about because caravans crossing the desert used. Mecca as a stopping place on the well-traveled incense routes. In addition, even before the time of Mohammed, it was also a holy shime of pilgiimages, where religious festivals were held at various places in and around the city. After the people of Medina refused to recognize Mohammed as the new Prophet, he made his followers turn toward Mecca as the holy place instead of Jerusalem In every inosque, the house of worship for Mohammedans, there is a niche in the direction in which Mecca lies, toward which the faithful look as they engage in their daily prayers.

The great mosque of Mecca, with its courtyard and colonnades, occupies a central square which divides the city into the northern upper and the southern lower towns. Lively bazaars almost surround the mosque and also occupy the smaller streets Between pilgrimages, the university hall in the mosque is used for lectures on law and science Streets are wide and unpaved, and the stone houses are often three stones high The city is large enough for more than three times its normal population in order to provide room for the pilgrims, as apartments in almost every house are rented to strangers During three or four months of the year Mecca is the greatest market in the East Since idolatious ages, visitors have been the source of wealth for local inhabitants, who are largely settlers or children of settlers, attracted by the opportunities for prosperity. The sherifs of Mecca, who are the descendants of Mohanimed, became a numerous and wide-spread group They wear the same costume, priding themselves on the green tobe which is the identification of their heritage

The colleges of Mecca have fallen into decay, and vast libraries which once existed have disappeared. With the exception of the mosque, there are no outstanding buildings in the city. The waterworks were constructed in 1571 by Sultan Selim II. With a strange combination of color and shabbiness, Mecca is one of the famous places of the world.

famous places of the world.

History.—The markets around Mecca attracted travelers of several tribes from many countries Ideas were traded as well as articles, and a religious center developed in which beliefs could be exchanged. After Mohammed returned as master in 629 AD, Mecca became primarily a religious center, with the Kaaba as the holiest site Merchants with their caravans across the desert were secondary to the great hordes of worshippers who came to pay tribute at their holy city.

Fairs were held at varying distances from Mecca, toward which the travelers advanced until they reached the religious center. The calendar for religious ceremonies was arranged so that they coincided with a time when food products and merchandise could be sold. The people of Mecca and surrounding places flourished as a result of these annual trades. Despite the fact that the geographical location was largely desert, there was very great prosperity. Under the name of religion, commerce and business expanded. The merchants of Mecca, with the impetus of Islam, built a real empire, for all the smaller

markets and fairs were secondary to the location of the Kaaba In the peak era, gems, drugs, silks, and other valuable commodities were brought from every corner of the Mohammedan world This was followed by periods of war and strife, when Mecca was finally taken by the Carmathians in 930 a.p. The greatest loss was the sacred black stone from the Kaaba which was not regained for many years. The Egyptian influence which spread across the area was at its strongest in the 13th century. With the Turkish supremacy in 1517, additions were made to the temples and the sanctuaries The Turkish authority lasted almost continuously until World War I, despite the Wahhabis (qv) and their movement for the reform of Islam King Husain of the Hejaz overthrew the Turks in 1916, and since 1924, when Mecca became part of Saudi Arabia, has been ruled by its king, ibn-Saudi

Arabia, has been ruled by its king, ibn-Saud

The Kaaba.—The Kaaba has been the main worship place of Mecca since before the time of Mohammed Abraham and Ishmael were supposed to have built it after a divine revelation. Later the traders from foreign lands brought their idols and established them here Mohammed threw out the idols and made it the Moslem shrine. The Kaaba is a stone building with a door about seven feet from the ground. Although there are no windows, older historians have described it as having five, made of stained glass. The principal object is the black stone which Gabriel gave to Abraham and survived the period of idol-worship. Pilgrims arriving at Mecca kiss the stone as their first obligation. The Kaaba has many sacred corners for worship and dedication. One place is the legendary spot where Abraham stood when he built the temple. In the time of Mohammed the outside walls were covered with a striped cloth, and pilgrimages continue to bring coverings of embroidery and brocade. It has had many beautiful articles of decoration, such as silver doors and lamps, although many of them are gone. There is a well that tradition says was the source of the water with which Hagar baptized her son Ishmael (See Kaaba).

Pilgrimages to Mecca.—The last of the five pillars of Moslem faith is the obligation to make a holy pilgrimage to Mecca and Medina Every person, faithful to the religion, must perform this duty at least once during his life. The pilgrimage takes place annually at a specified time, serving to develop a feeling of solidarity among the Moslems. People of all races and of varying degrees of poverty and wealth meet on an equal basis in their common devotion, for Islam does not recognize any barriers of race, nationality, or color. Women are permitted to make the journey as well as men. The pilgrims converge mainly from three directions. Those coming from the south are Mohammedans from Java, Sumatra, Indochina, India, and Iran, who pass across the Red Sea and on to Jidda, the port of Mecca. The northern group are from Asia Minor and Turkey, who go to the holy city by both land and sea routes. From the west, Egyptians, Moroccans, Algerians, and Tunisians reach Jidda through the Suez Canal During some years more than 40,000 have passed through the canal on the way to Jidda Throughout the pilgrimage a seamless garment must be worn, although a new one is put on before entering Mecca. No person is allowed to shave, or cut

his hair or nails, or shed blood, or uproot any plants

Arriving at Mecca, he must pass seven times around the sacred Kaaba and seven times between two adjacent mounds. On the way to Mina, which is outside Mecca, in the name of Allah he throws seven stones at the devil at each of three pillars. At Mina he also sacrifices a camel and a sheep, or some other horned domestic animal. The sacrifice falls on the tenth day of the month, which is celebrated throughout the Islam world as the Feast of Sacrifice. When a Moslem has completed the pilgrimage with all its many ceremonies, he is permitted to place the title hadji before his name. During the 20th century, between the two world wars, the average number of pilgrims was about 172,000 annually. Pop. (1946 est.) 120,000

Sec also Arabia; Koran; Mohammed; Mo-

HAMMEDISM; MOSQUE.

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MÉCHAIN, mā-shǎn', Pierre François André, French astronomer b. Laon, Aug 16, 1744; d Castellon de la Plana, Spain, Sept. 28, 1804. He became a mathematical tutor and also devoted himself in free time to the study of astronomy. In Paris he gained the interest of the famous French astronomer Joseph Lalande (q.v.), who assisted him in getting a government position where he was engaged in the survey of the French coast and in astronomical observations. In 1782, Méchain was elected a member of the Academy of Sciences; in 1785 he became editor of Connaisances des Tempes, in which were published some of his most valuable scientific papers. The National Convention in 1791 commissioned him with Jean Delambre (q.v.) to measure the arc of the meridian between Dunkerque, France and Barcelona, Spain. Their resulting calculations failed to satisfy Méchain because of a slight discrepancy. Although he was appointed director of the observatory at Paris, he persuaded the board to measure the arc between Dunkerque and the Balearic Isles. He died of fever in Spain while on the mission His accomplishments included not only the observation but also the discovery of several planets

MECHANIC FALLS, Maine, a village in Androscoggin County, altitude 280 feet, situated on the Little Androscoggin River. Since 1850 paper mills have been located here. Freelan O. Stanley, an inventor, was once principal of the high school and, with his twin brother Francis E. Stanley, built the early engines for their automobile, the Stanley Steamer, in Mechanic Falls. Pop (1940) 1,999.

MECHANICAL DRAWING. See Draw-ING, MECHANICAL. MECHANICAL ENGINEERING has been recognized as a separate branch of engineering since the formation of the Institution of Mechanical Engineers of Great Britain in 1847 Previous to that time there was but one branch of engineering in Great Britain other than military engineering, represented by the Institution of Civil Engineers (founded 1818), that was concerned with engineering for civilians. The development of textile machinery, steam engines, machine tools, pumping machinery, tuihines, and locomotives of that time made such a diversity of interests for civilian engineers that these and allied subjects were called mechanical engineering. A similar division into specialties occurred in the United States when the American Society of Civil Engineers of 1852 was followed by the American Institute of Mining Engineers in 1871, the American Society of Mechanical Engineers in 1880, the American Institute of Electrical Engineers in 1881 and the American Institute of Chemical Engineers in 1908, as well as a number of others with more limited activities.

Mechanical engineering deals with the design, construction, and operation of machines and devices of all kinds, and with the research and sciences upon which these depend. Among these machines are the prime movers such as engines and turbines using air, gas, steam, and water as operating media, pumping machines and other hydraulic apparatus, steam boilers, heating, ventilating, air conditioning, and refrigerating equipment; transportation structures used in aviation, automotive engineering, railroads, and ships, machine tools, special machines for industry and for the construction of buildings, roads, and harbors. In fact, mechanical engineering enters into the work of all engineers when machines are to be developed for the processes of specialists of the other branches of engineering. As mechanical engineering includes the construction and operation of its structures, manufacturing methods, management, and personnel relations are important subjects of study and research, as well as economics, statistics, and sociology because of designs calling for great expenditures of money and for the services of the public.

To understand better the extent of the activities and interests of mechanical engineers, the following lists of professional divisions and of technical committees of the American Society of Mechanical Engineers (A.S.M.E.) are given:

Professional Divisions: applied mechanics, aviation, fuels, graphic arts (printing), heat transfer, hydraulic (cavitation, hydraulic prime movers, pumping machinery, water hammer), industrial instruments and regulators, management, materials handling, metals engineering, oil and gas power, power, process industries, production engineering, railroad, rubber and plastics, textiles, wood industries

Technical Committees. standardization com-

Technical Committees. standardization committees, research committees, safey committees, boiler code committees, power test code committees. Each of these groups is under the direction of a main committee which determines the policy of the group

Although the titles in the above lists are quite clear to most people, it will be well to examine in some detail the work of certain of them

Machine Designing.—Production engineering has as its basic subject machine design. This includes the study of analytic mechanics, me

nisms (kinematics), properties of materials including elasticity, strength and fatigue, chemistry, metallurgy and metallography, and production Safety methods, management and control, and psychology are also used in production engineering where devices are built to function in accordance with the requirements determined by a theoretical study of a process or product. Such problems occur when power is to be produced by a gas turbine, or a machine is developed for electric deposition of tin upon a fast-moving strip of thin steel of great length for tin sheets, or one for the generation of high pressure steam of high superheat from some type of fuel. In other cases, machine elements are to be assembled to operate efficiently and dependably in proper sequence to reap, thrash, and bag wheat from a field when operated by automotive equipment, or to fill, cap, and deliver containers with some product held in a supply chamber For all of these problems studies must be made on materrals to be handled as well as on those used in the structure and their properties, and behavior may be ascertained only by research Models of proposed solutions are made to fix the final design and to determine data not known when the design is initiated. Machine design is used in the production of hydraulic presses of high pressure by which airplane parts, gun shells and casings, body parts for automobiles, and metal containers are formed from sheet metal. It is also used in the production of printing presses for the daily newspaper or for multicolor lithographs in which sheets or strips of paper are carried from piles or rolls at a supply station, printed, cut, folded, and piled at the delivery point without any human aid in handling

In the design of machines the subjects of vibrations, crutical speeds, stress concentration, and

fatigue are of great importance.

When parts of a machine are reciprocated or unbalanced parts are rotated, vibrations may be set up which result in excessive stresses or in movements of surrounding structures which may be at some distance from the moving part. To protect the machine and surrounding structures, the cause of the vibrations must be eliminated or lessened and sufficient materials must be used at places of excessive stress. The mathematical study of the forces set up by moving bodies to solve these problems is part of subject of mechanics and the applied mechanics division of the A.S.M.E. publishes results of investigations on vibrations. Instruments have been devised to measure vibrations of machines, and determine the amount and location of unbalance so that corrections may be made and parts of machines may be balanced before their incorporation into a structure

In rotating shafts with attached parts the amount and distribution of loads and the size of the shaft fixes certain speeds of rotation at which excessive stresses may be set up. These are known as critical speeds and the shaft diameters must be chosen so that the speed of operation is not near the critical speed. If the operating speed is above the lowest critical speed, as critical speeds have harmonics, care must be taken to prevent rupture on passing through this low

value.

When changes occur in the shape of the section of a machine part, the stress distribution so varies that an excessive value may occur at a given point. This is known as stress concentra-

tion and the amount of material used near this point is determined so that the concentration does not produce a stress above the allowable working stress. By the loading translucent models of structures photoelastic pictures from polarized light give the variation of strains so that

stress distribution can be known

When a load is removed and applied intermittently or reversed a great number of times, the part is subject to so-called repeated stress and as a result the stress at which the part will fail is much less than the ultimate stress because of the fatigue of the material Investigations extending over many years and covering different types of loading and different structural materials have fixed the safe allowable stresses to be used when repeated stresses occur. See also ELASTICITY, KINFMATICS OF MACHINERY; MECHANICS; STRENGTH OF MATERIALS
Fuels and Heat Transfer.—The subject of

fuels includes the study and use of solids, liquids, and gases, their transportation, preparation, and combustion, utilizing scientists and other engineers for this activity. The chemistry of combustion fixes the efficient utilization of fuel to produce the maximum amount of available heat by determining the necessary volume of the combustion space, the air fuel ratio, the manner of ignition, the temperature of ignition, the production of slag, and the condition of the fuel for proper ignition. The chemical analyses of the fuels and their products of combustion give the completeness of combustion and enable one to compute the heat losses in the exhaust gases when the temperatures of these are known Theoretical considerations fix the amount of dissociation at high temperatures By thermocouples and optical pyrometers high temperatures are measured.

The divisions of power and oil and gas power are concerned with the transformation of the energy of the fuels in engines and turbines with steam and by internal combustion in engines, turbines, and jets. In these applications the laws of thermodynamics (q.v) are used to determine heat transfer and the conditions for the most efficient use of heat energy. Heat transfer by radiation, conduction, and convection depends upon temperature and the properties and surface conditions of the materials from which, to which, and through which it is transferred. If heat is to be transferred though a partition, the velocity of the substances on the two sides of this wall, as well as their properties, also affect the heat transfer. In investigations for new data and for the determination of performance instruments must be available for measuring temperatures, mass flow, and velocities, as well as vis-cosity, density, conductivity, and other physical properties of all substances taking part in the

When the fuel is used in a boiler to produce superheated steam, the mechanical engineer must know the controlling factors for the heat transfer through steam-forming surfaces wetted with water, through superheaters, through economizers, and through air preheaters He must, in the United States, follow the rules of design prescribed in the boiler code of the American Society of Mechanical Engineers as this is law in many states. He endeavors to increase the efficiency of the boiler by reducing the losses due to the temperature and composition of the flue gases, the radiation and conduction through the

boiler setting, and the heat lost through the blow down necessary to maintain the proper condition of the water in the boiler. The mechanical engineer studies feedwater and boiler water to prevent foaming, incrustation, corrosion, and the embrittlement of steel for the water side of the boiler, and he scans the readings of his control instruments for evidence of soot on the gas side requiring the operation of the soot blower

In 1821 it was shown by Nicolas Léonard Sadi Carnot (qv) that in any heat engine for highest efficiency of transformation all heat should be added to the cycle at one fixed temperature, that all heat should be removed from the cycle at another temperature, and that these temperatures should differ as much as possible In the development of prime movers for the transformation of heat energy into mechanical energy this principle has guided the engineer in his airangement of the cycle. When the principle could not be exactly followed, the nearest approach to it was made consistent with costs If the increased yearly cost of apparatus to make a cycle more nearly equivalent to the Carnot cycle is not equal to the yearly savings from the improvement in efficiency, the change is not

One attempt to approach the Carnot cycle without excessive pressures has been the use of binary vapors in engines and turbines such as the steam and sulphur dioxide engines of Prof E Josse and the mercury vapor and steam tur-bines of William LeRoy Enimet. In the latter, mercury vapor was used to reduce the top pressure and this vapor at exhaust was used to produce steam in a boiler which acted as a condenser for the mercury vapor. The steam was superheated, used in a turbine, and condensed in the usual manner. Josse eliminated the very low pressures of the final exhaust.

The most recent developments in prime movers have been the gas turbine and the airplane and rocket jet. The gas turbine has ceitain advantages in weight and cost although it requires the utilization of much of its generated energy for operation. Oil and gas have been used as fuels. In 1917, investigations and constructions were being made in which coal was used as the

fuel for the gas turbine.

Since the latter part of the 19th century, internal combustion engines using gas, gasoline, and fuel oil have been perfected and are the most important forms of prime movers. Research and development are constantly improving performance as well as the properties of the materials used in construction See also Inter-NAL COMBUSTION ENGINE; JET PROPULSION.

Power Plants.—The design of power plants for the production of electrical energy is such an important phase of mechanical engineering that it is advisable to examine the various elements of this design. A preliminary study is made with the electrical engineers and business executives of a system of the present and future demands for energy at or near a given territory. From the ultimate demands for a steam plant and from the types and possible sizes of boilers and prime movers, the number and sizes of the units are fixed and the ultimate space requirements are determined, including the space for fuel storage, the amount of cooling water, and the needed transportation facilities. When internal combustion engines or gas turbines are to be used, this study would fix the same quantities, while

for a hydroelectric station the study is only made after a site is selected for which the necessary hydraulic and geologic data are known. The site finally selected from available land depends on price, soil conditions for toundations, available water supply, transportation facilities, fuel cost, including freight charges, facilities for removal of refuse, land occupancy in vicinity of site, and relation of location to the energy demands of the system. The layout of the plant follows the selection of equipment to meet the theoretical requirements for efficient and reliable operation of the station. The equipment includes fuel-handling machinery and storage structures with apparatus for preparation of solid, liquid, or gaseous fuel, boilers and accessomes, pumps, draft tans and motors, chimneys and flues, and instruments to control operation and measure performance. The prime movers include engines and turbines with condensers when steam is used, piping for steam and water with pumps for air and water. The piping must be erected so that expansion may occur on changes m temperature This requires extensive calculations of stresses in parts and forces on anchors Models of the piping of reduced scale may be used to check results or to furnish needed data. Expansion in machines as well as m piping must be permitted to prevent supture of piping or foundations. In plant layout, traveling cranes are provided for original erection and for removal of parts for inspection or repair.

In the layout of hydroelectric power plants the study of the stream flow at a selected site covering the record of many years and the probable storage capacity fixes the prime power available throughout the year, and from financial and physical considerations the secondary power for part of the year is determined as well as the operating head. From these the number and size of the units may be fixed with consideration of the size limitations of shop and transportation facilities. From the selected size, possible speeds of the electric generators and the operating head, the type of turbine is fixed by the so-called spe-cific speed (speed multiplied by the square root of the horsepower divided by the five-fourths power of the head). For high heads the specific speed is often low and a Pelton type of water wheel is used, while with low heads the high specific speed demands a propeller type of turbine For intermediate specific speeds the Franas type of turbine is used. It sometimes happens that the specific speeds available and the head with the actual speed of rotation fixes the greatest power from one unit. To prevent the separation of the water from the turbine blade, known as cavitation and due to low pressure in the draft tube, the depth of water at the discharge of the draft tube below the tail-water level is made equal to a computed limiting depth The draft tube is the conduit between the turbine and the discharge canal or tailrace. It is used so as to place the turbine at an elevated position and as a regainer of much of the kinetic energy of the water at the discharge point of the runner. Cavitation produces crosion of the blades and its occurrence must be prevented.

The design of the dam and its construction result after the study of the geologic conditions at the selected site has fixed the permissible bearing power of the soil. When the dam is a high concrete structure, this is cooled by refrig-

eration during construction to remove the heat generated in the aging of the concrete so as to reach a safe state before the water is impounded in the storage reservoir. Penstocks or pipes are designed to bring water to the turbines and the tailiace must be cleared to deliver the discharge freely Studies must be made of the backwater curves above and below the station to ensure a known rise of the water at the upper end of the storage reservoir and the stream supplying it and to make certain that the tail-water level is that desired at the power plant. The backwater curves or surfaces of the streams are computed for the maximum flow conditions. To prevent damage to the dam, excess water in times of flood is discharged over a spillway designed to care for the probable maximum flow at the site The design includes ice chutes for winter and fishways to care for fish which ascend the stream for spawning

In fixing the number and size of units for a station, spare equipment must be installed in an isolated station to care for the outage of the largest unit; while in a system station the number and size of units are fixed by the maximum output desired, any outage being cared for by other stations. Stations with equipment of high efficiency are used as base load stations operating at full load, the changes in system load being carried by other stations. A stand-by station to be operated when failures occur in other stations or for occasional short peak loads is designed with less efficient and less expensive equipment because of its infrequent use. The few hours of use do not justify high costs

In all central stations complete instruments and regulators are used to give records of operating conditions and performance so that improper conditions may be corrected and from which costs of production can be determined and efficiencies of various elements computed.

For the pumping of water and its distribution, large pumps, welded pipes, and canals have been designed and built. These have required the testing of models to determine the effects of changes in design and anticipated performance of the full-size project. See also Electrical Engineering; Hydraulics, Power Houses; Pumps and Pumping Macuinery: Turring.

AND PUMPING MACHINERY; TURBINE

Heating, Ventilating, Air Conditioning,
Refrigeration.—The subjects of heating, ventilating, and air conditioning of buildings and the heating and refrigeration of materials require a knowledge of heat transfer, the properties of fluids and gases, the properties of building materials and of the materials to be stored or processed, as well as the requirements for health and comfort of persons. This division of engineering includes not only the selection of equipment but also its design, manufacture, and operation. During the period of World War II this field of engineering was greatly expanded owing to war conditions as well as for the necessity of uniform atmospheric condition for the processes of many industries.

These subjects require the determination of the heat loss or gain through partitions, walls, floors, and roofs after the application of insulating materials, and the amount of heat from illuminants, machines, materials, and occupants, and finally the necessary addition or removal of heat to maintain a required condition. This heat is transferred by conduction or radiation through conduits or radiators carrying a fluid to absorb

or deliver heat or by air in condition to effect the same result by convection The computations are based on the results of research regarding heat transfer of surfaces and materials by convection, conduction and radiation, the heat developed by manufacturing and physical processes, by lighting equipment and machines, by materials to be stored, and by human occupants Studies have been made to fix condition of human comfort as well as those required by manufacturing processes. The effect of the wind and the sun on heat demand has been found by research which is continuing after many years

Although radiators for direct heating and heated air for indirect heating have been used extensively, radiant heating from fluids in pipes imbedded in partitions, floors, or ceilings is now (1947) being applied in many buildings for con-

venience, comfort, and efficiency

To prevent heat loss from buildings or from pipes and ducts conveying the heating fluid, insulating materials are applied These materials and their amounts at any particular location depend on temperature difference as well as upon exposure, velocity of the ambient fluids, and at-Their composition and properties mosphere have resulted from extensive research and design of manufacturing processes

Control apparatus has been developed by mechanical engineers by which the temperature and humidity are maintained throughout a re-gion in which heat demands and occupation may vary over a wide range Not only are thermostats and humidostats employed, but valves are operated by relays so that the necessary alterations are made to the system to meet the changed

conditions

Mechanical refrigeration is accomplished by producing a low pressure around a liquid refrigerant so that it will vaporize and remove heat at low temperature and then by compression producing such a pressure that the resultant vapor in tubes will be condensed by the abstraction of heat by the surrounding water or air at atmospheric temperature Compressors used for this purpose of maintaining low pressure in one part of the system and a higher pressure in another part are of the piston and cylinder form when the pressure difference is great and of the centrifugal form when small differences of pressure are required. At times these pressure differences are maintained by the partial pressure of a noncondensible gas in the evaporating section of the systems, and then permitting the pressure to rise by separating the noncondensible gas for condensation, or the low pressure may be maintained by absorbing the low pressure vapor by a liquor or adsorbing it by a solid from either of which it is released at high pressure by heating the resultant liquor or solid. In each of these systems the method of action is the equivalent of that first stated.

Refrigerants are supplied to heat transfer coils or surfaces for the removal of heat from materials or spaces When the accidental escape of fluid or vapor would be deleterious to persons or materials, heat is first removed from brine by the refrigerant and the brine is circulated in the regions to be refrigerated. The piping used for circulating the primary or secondary refrigerant must be fully insulated whenever conditions exist under which heat may be absorbed by it Not only the piping but the cooled spaces must be carefully insulated by various materials developed for this purpose. These include cork products. mineral wool, asbestos, aluminum foil, fiberglas. and flotofoam, a synthetic plastic

To obtain the large amount of cooling water for the condensers of refrigerating systems, cooling towers are used in which the warming of air supplied by fans and the evaporation of some of the falling hot water so cools the latter that it may be sent to the condensers to continue its licat removal

The cycles used in refrigerating machines remove heat from places required to have low temperature by vaporizing liquid refrigerants places in coils. After the vapors are withdrawn from the coils and compressed to a higher presstire, they are condensed by cooling water at atmospheric temperature. The refrigerant then repeats the cycle and is thus reused indefinitely. The heat in the water is heat from the cooling coils, plus heat equivalent to the work of compression Such heat is usually thrown away, but in the second half of the 19th century, William Thompson (Loid Kelvin) suggested that it might be used for heating buildings in cold weather This "heat pump" of Thompson's was never used commercially until after the first quarter of the 20th century. In these applications, heat is drawn at low temperature from the atmosphere, or from well water, by the evaporation of the refrigerant, so that this heat, plus heat from the work of compression, can be used for space heating. The cost of such heat is only that of the small amount of power used for the compressor. After installation, the same equipment may be used in summer for air conditioning by merely shifting a few valves or dampers, which interchange the functions of the evaporator and the condenser.

The making is one of the applications of mechanical refrigeration for which studies have been made to produce clear ice from raw water, climinating the work of distillation. See also AIR CONDITIONING; BUILDING MATERIALS, EQUIP-MENT, AND TECHNIQUES; HEATING; REFRIGERATION, VENTILATING

Railroads.—Railroad mechanical engineering is concerned with the development and improvement of motive power, cars and the air conditioning and refrigeration of them, the elimination of friction in bearings of wheel axles, the reduction of vibration of cars, the treatment of boiler water, the improvement of combustion, the operation of shops, and the maintenance of all equipment During the fourth decade of the 20th century the Diesel engine for motive power was so increased so that by 1945 over 3,000 Diesel units were in service. These engines were connected to generators which supplied electric energy to motors on the locomotive trucks elminating the vibrations of the steam locomotive and giving uniform torque on starting. In 1945 steam turbines were applied by gears to driving wheel axles of a locomotive and later designs were being completed for the application of a gas turbine to the locomotive. To reduce the crank pin loads on locomotives, four cylinders were applied in place of two large cylinders.

Marine and Aviation Engineering.—Marine mechanical engineering is devoted to materials handling, fire protection, drainage, steering, water supply and plumbing, kitchen equipment, elevators, heating, ventilating, air conditioning, and refrigeration, as well as to boilers

and prime movers.

The professional division of aviation is concerned with the theoretical study of flight, the design of the plane and its parts, the power plant and accessories as well as air conditioning for temperature, humidity, and pressure The manufacturing and maintenance methods, the materials to be employed for parts and the instrument to be used for operation are all as important as the design principles used in planning. Not only are wind tunnel tests necessary but materials and production methods must be tested for suitability, accuracy, strength, and durability Testing of finished planes or models in flight and m special maneuvers with instruments for measuring performance and stresses in various structural elements supplement the works of the wind tunnel There are peculiar requirements for the airplane power plant which demand special study for engine, turbine, or jet. The variation of air density and temperature require special devices or materials such as superchargers, or special lubricating oils. See also Aero-NAUTICS

Materials Handling .-- Materials handling includes the design, construction, and operation of cranes, elevators, conveyors, traveling belts, chutes, transveyors, cableways, hoists, draglines, shovels, and excavators, car handling devices, ship loading and unloading devices, industrial railways, tractors, trucks, coal and ash conveyors, trolleys, and pneumatic conveyors. These are really devices planned by the principles of machine design after data relating to power for driving and peculiarities of operation have been determined by research. Studies must be made of the required performance and the cost and adaptability of different devices or systems by which desired results may be accomplished. See also Conveyor

Wood Products, Textiles, and Metals .-The division of wood products is concerned with all steps from logging to the final product, and includes the studies of the wood during these stages as well as the machines required throughout the processes. The developments of compressed plywoods and the methods of gluing have extended the use of wood for many purposes. (See also Wood Chemistry and New Uses)

For textiles, mechanical engineers not only design and produce machines for carding, spinning, weaving, and knitting but they lay out, build, equip, and operate the mills in which these machines are employed. Mill operation of the process industries require a study of management, production control, labor relations, purchasing and selling as well as maintenance and power supply. (See also Textile Machinery.)

Metals engineering covers the construction of machine tools, furnaces, rolling mill equipment, and the instruments for control of the opera-tions and the testing of products Many of the operations dependent on human strength have been made mechanical Devices for safety and human comfort have been introduced Conditions of operation have been made uniform so that product can be predicted. The tools used in metals industries have been improved and the metallographic studies have so changed their quality that longer life of service and less power demand have been secured.

Professional Training.—To prepare for the profession of mechanical engineering one may advance from the shop through study at the

company institute of many organizations, or through home study, or one may advance through practice after graduation from a four-year course in a school of engineering. In each of these cases the engineering training is based, in the United States, on the graduation from a tour-year high school program, or its equivalent The studies include four years of English, four years of mathematics, one or two years of science, three or more years of foreign languages, and electives from such subjects as science, history, civics, or music to bring the total credits to 14 or 15 one-hour courses each extending over a year Because of the future development of the young engineer, his studies in the school of engineering, in the company institute, or in self-education should be extensive and intensive and designed to develop in him the ability to analyze and reason from known data with selfreliance, persistence, thoroughness, dependability, loyalty and the spirit of cooperation, rather than to give him merely facts from which to find solutions to problems. The training should fit him to develop ability, breadth of knowledge and judgment after the formal training is completed.

With this in view, the course of study includes thorough grounding in mathematics through differential equations, physics, chemistry, metallurgy, English, economics, social science, and psychology to which are added subjects common to most engineering courses and special mechanical engineering subjects. The general engineering subjects so prepare the graduate mechanical engincer that he may enter one of the other branches of engineering should opportunities and conditions make such a change advisable. The success of many engineers in branches different from that from which they graduated is evidence of the value and thoroughness of the training in those general courses

These general subjects include engineering drawing and descriptive geometry (universal language of engineering), elementary surveying, power generating machinery, mechanism, statics and dynamics of analytic mechanics, strength of materials, thermodynamics, direct and alternating current electric machinery, hydraulics, machine design, and a course dealing with engineering administration. Among the special mechanical engineering subjects from which selections are made are heat power, engine and boiler design, power plants, heating, ventilating and air conditioning, refrigeration, hydraulic power, production methods and mechanical engineering labora-

Free electives are open in languages, philosophy, art and archaeology, biology, astronomy, geology, and politics.

The records of the graduates of engineering schools indicate that after a few years many become supervisors or administrators rather than designers and producers, and for this reason the curriculum of the school of engineering should be planned to develop breadth of vision and the sympathetic consideration of the views of others while it trains the student thoroughly in the professional subjects which he must know to

guide others under his administration
Throughout the United States the practice of professional engineering as an individual requires a state license. This is granted by a state board upon the presentation of evidence of approved practice of engineering for eight years

and the passing of an examination.

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MECHANICAL MOVEMENTS, POW-ERS AND APPLIANCES. The primary, fundamental mechanical continuances are termed the mechanical powers, seven in number and all based on the principles of either the lever or the inclined plane. The common classification is the lever, wheel and axle, cord and pulley, toothed wheels (these four operating on the lever principle), and the inclined plane, wedge and screw (operating on the principle of the inclined plane) What are known as the mechanical movements (sometimes called mechanical motions) include about 750 of the more or less simple and common combinations, covering practically all the fundamental arrangements of the mechanical powers for machine building and engineering work. They consti-tute the groundwork which the machinist or student of engineering must master before he can make much headway in understanding the complex problems which arise in practice.

Taking first the simple lever, it is found to be of three classes: (1) those in which the fulcrum is situated between the power and the weight; (2) those in which the fulcrum is at one end of the lever arm with the weight nearer to it than the power; and (3) those in which the fulcrum is at the end with the power nearer to it than the weight.

In the first, if the weight W is nearer to the fulcrum, there is a mechanical advantage—illustrated by the crowbar, which on account of the great difference in the length of its aims is advantageously used to overcome great resistance Scissors and nippers are double levers of this class. If the power P is nearer to the fulcium, there is a mechanical disadvantage, and if the weight and the power are at an equal distance on either side of the fulcium, the power is equal to the weight and gives an airangement similar to the ordinary balance

The distinction between the gain of power

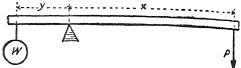


Fig 1-Lever of the First Order

and the loss of velocity, and the reverse of these conditions, as depending upon the position of the fulcium, is exemplified by the shears used for cutting metal and those used for cutting cloth, respectively. In the former, short blades with long handles overcome a great resistance slowly, while in the latter, long blades operated by short handles, move quickly

In the second class there is always a mechanical advantage. The wheelbarrow is an example of the simple lever. The fulcrum is at

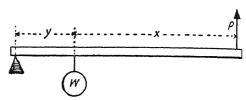


Fig 2-Lever of the Second Order.

the centre of the wheel, the weight acts downward at the centre of gravity of the load and the power is applied at the ends of the handles A hinged nut-cracker is an example of a double level of this kind.

In the third class there is always a mechanical disadvantage; but great rapidity of movement is obtained. The human foreaim is an example of a simple lever of this class. The fulcium is at the elbow-joint, the weight acts downward at the hand and the power is applied

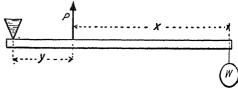
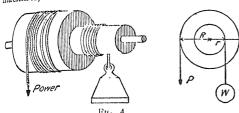


Fig. 3-Lever of the Third Order

obliquely by a tendon from the biceps muscle attached near the elbow A pair of tongs is an example of a double lever of this class.

The wheel and axle consists of two cylinders of different sizes rigidly connected together and turning about a common axis. The larger cylinder is called the wheel and the smaller the axle. The power is applied to the end of a rope wound around the wheel and the weight is raised by a rope wound around the axle;

see Fig 4. The diameter of the larger cylinder or wheel being twice that of the smaller cylinder, or axle, a power of one pound at P will balance a weight of two pounds at IV.
This is essentially a form of lever, and "the power is to the weight lifted as the radius of the axle is to the radius of the wheel." The principle is applicable to all forms of hoisting machines, steering gear of ships, fusee clock



and watch movements, etc If the axle be fixed and the wheel be loosely mounted to revolve on it, we have the ordinary machinist's loose pulley and a variety of uses suggest themselves. If the axle be fixed to the body of a carriage and the wheel allowed to rest on level ground, we find that the carriage can be drawn along with slight effort, requiring a push or pull representing only a small fraction of its weight.

The cord and pulley shows the further uses The cord and pulley shows the further uses of the wheel as a lever. In the arrangement shown in Fig. 5 the upper points F are fixed, being virtually fulciums, a downward pull of me pound one foot on the cord P will raise the weight W, which may weigh nearly two pounds, a half foot, it would balance two pounds but for the loss by friction. effort on the crank can raise nearly 400 pounds at every turn, and in eight turns he will raise it six feet, the distance of travel of the crank at one turn.

A very common arrangement of pulleys, called stepped pulleys, is shown in Fig 7, as positioned for driving a lathe. The steps of the pulleys on the lathe are supposed to be 3, 6, 9 and 12 inches diameter, respectively 3-inch lathe pulley, and obviously, if the power shaft is making 100 revolutions per minute, the lathe-shaft will make 400. If the belt be shifted to the next step, where the proportions are 9 to 6, the 100 revolutions of the power shaft will give 150 revolutions of the lathe shaft. On the third step 6 to 9 is the proportion and the lathe will rotate at a speed of 66½ revolutions; on the fourth step it is 3 to 12, and the 100 revolutions of the power shaft will give but 25 of the lathe shaft See PULLEY

Toothed wheels, now commonly called gearwheels, illustrate another type of wheel leverage Spin gears are shown in Fig 8; here the smaller gear-wheel rotates twice to cause one revolution of the large wheel, thus a small wheel secures increased power at reduced speed

In Fig 9, the large wheel, being the driver, turns both the small wheels in the same direc-tion, but oppositely to itself, and gives the shafts of the small wheels two revolutions to one of the large wheel In Fig 10 are shown bevel gears, which coact at right angles. It is apparent that almost infinite combinations of such gears are possible. See Wheel Gearing The inclined plane is simply a rigid fixed

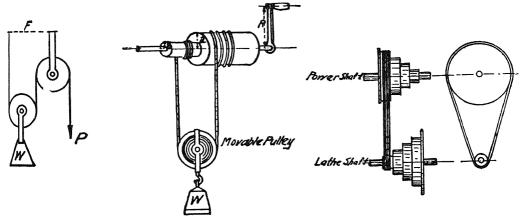


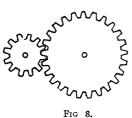
FIG. 7. Fig. 6. Fig. 5.

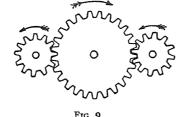
In Fig 6 a movable pulley is shown in combination with the wheel a and axle b and a crank R is added. If the crank is one foot ong, the wheel one foot in diameter and the axle six inches in diameter, one turn of the crank may draw up the right hand cord about three feet, and lengthen the left hand cord about 18 inches, resulting in raising the pulley and attached weight W 9 inches. As the crank handle has traveled cheaters foot are girlt times. handle has traveled about six feet, or eight times as far as the weight is raised, the leverage is 8 to 1, and a boy who can put 50 pounds of

plane inclined to the horizon at an angle, and upon which a weight tends to slide down by gravity, or up the slope of which a weight may be pushed or rolled by a force usually horizontal in its action. In Fig. 11 the sliding weight would fall back if the power was withdrawn; it also shows power applied horizontally to move a rolling weight up the plane. In this latter case a continuing power of less than a pound will push a pound roller up the incline because the power has a distance greater than the height overcome in which to exert itself.

The inclined plane principle is used in rolling barrels up on a wagon, in loading logs on a sled, in the operation of a mountain railway and in the cam, which is described later. The employment of the principle does not reduce the work of lifting to the top of the plane, but extends the time of the lift, so that a smaller force used for a longer time does the work.

The screw is essentially an inclined plane wound spirally around a cylinder, in the form of an advancing groove, known as the screwthread A cylinder having such grooves cut interiorly like the inside of a nut is termed a The screw shown in Fig 12 has female screw two grooves spiraling around and is therefore double-threaded There being eight threads to

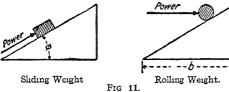




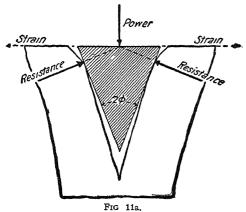


The wedge (Fig. 11a) is a double plane and gives power at the expense of speed. It is sometimes considered as a combination of two inclined planes placed base to base. The mechanical advantage increases as the angle of the wedge decreases - "the power being equal

to twice the resistance into the sine of the angle of the wedge. The relation, however,



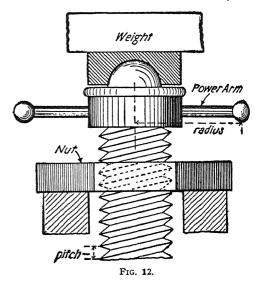
has but little practical value since the resistance due to the friction is very great. The principle is used in many forms of cutting tools such as The principle the knife, the chisel, axe and plane For working in comparatively soft materials, the angle is kept small and the edge sharp; but for harder materials the angle is increased Metal planing tools have very large angles, ranging from 60



degrees to 80 degrees When the wedge is employed for cleaving wood, the cohesion and friction combined produces so great a resistance that the force is applied in the form of a blow from a heavy body, and the resulting strain is equal to the force of the blow multiplied by the length of the wedge divided by its width. See WEDGE.

the inch, the pitch of this screw may be regarded as one-eighth of an inch, the distance between threads; or as one-fourth of an inch. the distance between one spiral and the next turn of the same spiral. The principle of the screw is used in the screw propeller (q.v.), and the litting jack or jackscrew. See SCREW

A mechanical movement is some simple combination of the elementary powers described above Perhaps the simplest are the familiar crank (qv.), cam (qv) and cylinder and piston. (See Steam and Steam-Engines). A



few of the more familiar movements are here grouped and illustrated If fully mastered and understood they will be of great assistance to the student of mechanics in understanding the more difficult and complicated descriptions and drawings of modern machinery.

Fig. 13 is a rack and pinion, for converting rotary motion into linear motion, or the reverse, according to whether the rack or pinion is the driver

Fig. 14 shows a pinion between two racks If the lower rack be fixed and the pinion rolled one foot the upper rack will move two feet. In this way the stroke of a piston can be doubled.

Fig. 15 is a gear-wheel and worm, for changing a rapid rotary motion into a very slow rotary motion. One rotation of the worm turns the gear-wheel the distance of one tooth

Fig 16 is a group of bevel gears, positioned as in the differential on the rear axle of an automobile Either of the large bevel-gears may drive the other through the small bevel-

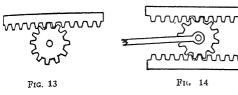


Fig 17 is a mangle wheel and pinion The pinion P drives, traveling around the long C-shaped rack, rotating the mangle first into one direction then in the reverse direction

Fig. 18 is a pair of eccentric gear-wheels, either of which may be the driver. The rotation of the driven wheel is alternately slow and rapid

Fig 19 shows a couple of pump-cams As they touch at every point of their rotation they

travels in the slot it raises and lowers the rod r, rapidly in one direction, more slowly in the other

Fig 23 is a parallel motion. To whatever distance the bars are moved they are held parallel by the slanting connections.

Fig 24 is a shears for cutting metal. The wheel w and pin operate the upper blade, giving a long leverage for increased shearing power

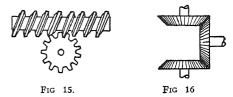
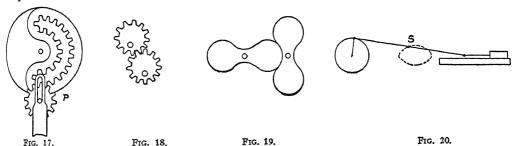


Fig 25 is a toggle joint Only a slight force is required to throw the two levers into line exerting a vastly multiplied energy over a short distance. It is used in many machines to apply a sudden pressure

Fig 26 is a universal joint, permitting a rotating shaft to be bent to a slight angle as necessary, without interfering with its working Fig 27 is a three-throw cam. The three-

Fig 27 is a three-throw cam. The threepointed wheel measures the same at every point



may be used to raise a column of water by lifting.

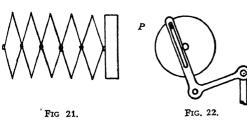
Fig. 20 is a diagram of a crank and piston movement. It will be noticed that the spot s on the centre of the piston rod describes an oval. The nearer this spot is placed to the piston the more elongated is the oval. If the student will make a pattern of this in cardboard and test it in various positions he will get a far better understanding of why a crank motion is so generally preferred in machinery

of its diameter, and as it rotates gives a reciprocating motion to the rod, moving it back and forth three times to each revolution.

Fig 28 is a heart-cam for giving irregular reciprocation to the rod.

Fig. 29 is an ore-stamp. The cam shaped like a long s raises the stamp twice during each revolution and leaves it free to drop by gravity. Fig. 30 shows a drum-shaped cam C whose

Fig. 30 shows a drum-shaped cam C whose groove moves the shaft S of the large wheel W alternately to the right and left



for altering rotary into reciprocating motion—the change is so gradual that jar is obviated.

Fig 21 is a lazy tongs or combination of levers which support each other and permit rapid change of position

Fig 22 is a combined bell-crank and wheel-crank for altering rotary motion into reciprocating. The wheel drives and as the pin p

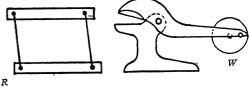


Fig. 23.

Fig. 24.

Fig 31 is an eccentric, or wheel mounted out of centre, so that through the encircling straps it gives a reciprocating motion to the rod. It is much used on steam-engines.

rod It is much used on steam-engines.

Fig. 32 is a pair of pulleys connected by a twisted belt for reversing the direction of

rotation of one of the shafts.

Fig. 33 is a two-speed gear. The pulley a

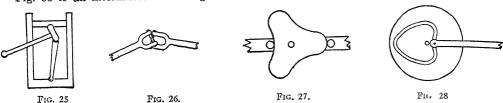
being the driver, the upper large pulley is driven on one speed, when the helt is shifted to b, which is a loose pulley there is no driving; when the belt is shifted to c the other drive at a different speed is effective

Fig 34 is the steering gear of a sailing vessel, showing how the turning of the hand-wheel w is made to shift the ropes rr and throw the

tiller t of the rudder to right or left
Fig 35 is a positive "silent" chain drive
Either the chain or gear-wheel may drive
It is used on auto-trucks and a variety of heavy machinery where belts are madequate

Fig. 36 is an intermittent motion given the

is constant, as in the case of clock devices, the times of vibiation are equal; (2) that when the force of gravity is constant, as is the case of any given point on the suiface of the earth, the time of vibiation varies directly as the square root of the length of the pendulum, so that, if a pendulum of a given length vibrates in one second, a pendulum one-quarter as long will vibrate in one-half of a second, and one four times as long will vibrate in two seconds, (3) that when the length of the pendulum is constant, the time of a vibration varies inversely as the square root of the force of gravity, and (1) that when the time of vibration of two



toothed wheel by the rotation of the notched Every time the notch comes around it advances the wheel one tooth

Fig 37 is an escapement. The levers are connected with a pendulum or the like and at every swing allow the wheel to turn one notch

Fig 38 is a ball governor as used on steam-engines When a certain speed is exceeded the balls are thrown out by centrifugal force, and rise, opening a valve or adjusting a cut-off and thus reducing the speed back to the normal

"Compound motions" are obtained by combining any two or more of the simple motions, and machines are built up by combining the simple motions harmoniously.

pendulums at different points on the surface of the earth is equal, their lengths vary directly

as the force of gravity See Pendulum
"Perpetual motion" is a continuous or incessant motion supposed to be attainable by a mechanical device with inherent motive energy. and, therefore, which when once set in motion is capable of continuing that motion indefinitely or perpetually Such a device or machine, if practicable, might be termed a "perpetual movement »

The various forms of mechanical movements embodying the principles of one or more of the mechanical powers already described are so innumerable that a detailed description of them

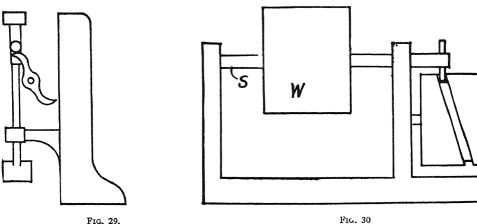


FIG. 29.

"Pendulum motion" is the oscillatory motion of a body in the arc of a circle, the body being attached to a rod which vibrates to and fro from a fixed axis. In the ideal simple pendulum, consisting of a body attached to a string without weight and vibrating from the point of suspension without resistance of any kind whatever, a material body once set in motion would continue to swing to and fro forever

Under these conditions it has been noted (1) that the time of vibrations of a pendulum through short arcs is independent of the lengths of the arcs and that when the length of the arc is impracticable within the scope of this article; but they are classified as follows into several important groups according to the general pur-

poses for which they are used.
"Transmission of power appliances," consisting of ropes, belts and various forms of gears, pulleys, etc.

"Measurement of power appliances and devices," used for determining velocities, pressures, weights, number and quantities, such as brakes, counters, dynamometers, gauges, indicators, meters, planimeters, testing machines and weighting machines.

«Steam power appliances," comprising hoilers, locomotives, locomotive engines, oscillating engines, rotary engines, steam-engines, steam turbines, valves and valve-gears, parallel motion gears, governors and other engine devices

«Steam appliances," such as injectors, steam pumps, condensers, separators, traps and valves.

"Motive power machines," such as gas-engines, internal-combustion engines, heat-engines

gines, solar engines, etc

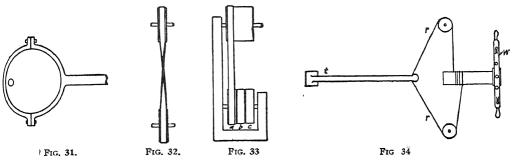
"Hydraulic power appliances and devices," consisting of various forms of waterwheels, water-motors, turbines, pumps, syphons, waterlifts, ejectors, hydraulic or water rams, meters. indicators, pressure regulators, valves, pipe joints, filters, hydraulic presses and hydraulic stop motions, wipers, shafts, couplings and gyro-

scopes.

"Horological apparatus and devices," mainly used for measuring time, such as spring and pendulum clocks, watch and chronometer move-ments, electric clocks and sundials

"Mining machinery and appliances," such as quarrying and cutting machines, borers, drills, valves, blowers, ventilators, safety lamps, hoisting drums, conveyors, crushers, pulverizers, hydraulic nozzles, presses, air-blast and magnetic separators, steam shovels, dredges, haulage appliances, furnaces and automatic dumps

"Mill and factory appliances," such as hangers, shaft bearings, ball hearings, steps, couplings, universal and flexible couplings, speed



metal-working machinery such as riveters, rail-

benders and punches

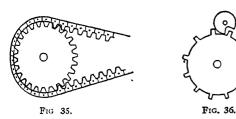
"Air power appliances," devices and apparatus consisting of air compressors, air pumps, air water-lifts, barometers, bellows, blowers, blowpipes and compressed-air tools such as pneumatic drills, hammers, riveters and shearing ma-Also, gauges, ventilators and musical chines instruments

"Electrical power and construction appliances" such as generators, motors, wring devices, controlling and measuring devices, lighting arrangements, electric furnaces, heaters, fans, searchlights and dulling machines

"Navigation appliances" used for operating

gears, shop tools, screw threads, hoists, stamp mills, saws, punches, shears, bending machines, grinding machine, cotton presses, looms, knitting machines, etc.

"Engineering construction appliances," such as mixing machines, testing machines, stump and pile pulling machines, blocks and tackle, hoisting machines, tackles hooks, pile drivers, automatic dumps and dumping cars, stone grips, derricks, conveyors, timber splicers, metal welding devices, tools, wood-preserving apparatus, cable carriers, dams and embankment escala-tors and moving platforms, "Ferris" wheels, high structures and buildings, roof and bridge trusses, trestles and bridges



steamships, sailing vessels and yachts, such as sails, rope knots, block and tackle, paddle wheels, screw propellers, steering gear, anchors,

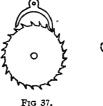
windlasses, capstans, cranes, etc.

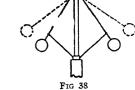
"Road appliances," used in the construction of roads, highways and railroads, such as scrapers, rollers, excavators, vehicles, automobiles, bicycles, motor adjuncts, wheels, road gates, lamps, etc.

"Gearing," consisting of rack and pinion de-

vices, spiral, elliptical and worm gears, differential and stop-motion gears, and epicyclical and

planetary trains. "Motion and controlling devices," consisting of rachets and pawls, cams and volute cams, cranks and variable cranks, intermittent and





"Agricultural machines and implements," such as plows, tethering hooks, wash boilers, washing machines, mowers, grain harvesters, threshing machines, cream separators, refrigerating machinery, cold storage houses, refuse crematories, silos, kilns, ovens and furnaces "Draughting devices," such as dividers, dot-

ting pens, parallel rules, curve delineators, trammels, ellipsographs, pantographs, etc.

"Tools," hand and machine, such as saws,

chisels, mallets, planes, borers, etc.

"Perpetual motion devices," consisting of various forms of hydraulic, hydrostatic and

magneto-electric apparatus
Bibliography.—For descriptions of a great
variety of special movements, appliances and

devices, consult the works on the subject by Hiscox, Rheile, Ruleau and Spon, also the special articles on the various forms of appliances enumerated under the general classes stated in this article.

CHARLES H. COCHRANE, Author of 'Wonders of Modern Mechanism.'

MECHANICAL SIZING. Classification of Dry Granular Material.- The mechanical classification of dry granular material is the result of the action of several natural laws operating in conjunction with a mechanical device so arranged as to permit the balancing of the action of one law with another The combined motion places the relative action of the dry granular material completely under con-trol of the mechanical device. The first active law in mechanical sizing is termed the laws of selectiveness When mixed particles of various sizes of granular material are under agitation upon a level plane, the finer particles sink to the bottom and engage the surface while the coarser particles rise to the top without regard to the specific gravity of such particles. The second active law is called the law of displacement or the displacement of the centres of gravity of particles upon an inclined plane. The relative difference in the tendency of coarse and fine material of granular shape to move down an inclined plane is due to the difference in the displacement of their centres of gravity upon the same angle of plane. The third active law is the law of friction of mass or the "coefficient of friction.»

Close observation of the action of these laws as well as the influence of other forces led to the design of a "mechanical sizer" simply arranged to best meet the requirements of these laws. In order to assist the law of selective aclaws. In order to assist the law of selective action on an inclined plane, a series of several hundred tapered riffles or grooves are placed on the inclined surface of what is termed the deck of the device. This permits the "fines" to sink to the bottom of these grooves and forces the discharge of larger particles over the top of the riffle, in accordance with the action of the law of displacement of centres of tion of the law of displacement of centres of gravity. This is accomplished by the feeding of dry material to the inclined deck while the same is being agitated forward and backward by a specially designed head motion, which pushes the deck forward at one speed and causes it to return at a higher speed. This sets up what is termed a progressive action of material on the deck or causes the granular particles to travel in a forward direction, under the government, however, of the law of selective action and the law of displacement aided by the law of friction of mass. Under operation, the device is fed with dry ore, sand, grain or the like, the feed engaging a feed board where a preliminary rough separation is accomplished by a modified application of tapered riffles The feed then engages the table deck at the head of its proper zone and here, because of the length and the great number of riffles, almost any esired number of carefully sized products may be taken off by placing receptacles at the bottom and far edges of the deck, from which falls, when in action, a constant sheet of granular material graded carefully from coarse particles to fine dust

Mechanical sizing is applicable to every form

of dry granular material such as crushed ore. salt, coal, sand, emery, cereals, unbroken or crushed, or, in fact, there is no field in dry sizing now filled by metallic screen devices that cannot be filled by a mechanical sizer and often with greater economy and efficiency proved by the fact that metallic screens blind and lose their efficiency while the mechanical device cannot clog or blind and automatically cleans itself. Specific gravity has practically no effect upon mechanical sizing for the reason that granular particles of the same contour and volume, when placed upon an inclined plane, have the same displacement of their centres of gravity with the result that a particle of lead and a particle of sawdust of the same size and shape will discharge from the table at the same point, although the specific gravity of the one is many times that of the other

MECHANICAL TERMS. Words, compound words and short phrases, having definite meanings other than those of ordinary usage and specifically applicable to the use of tools and other mechanical appliances; to the construction and operation of machines, and to the methods employed and the manipulations required in the working and manufacture of the various kinds of materials used and the articles employed for engineering, structural and other industrial purposes.

A great many of these terms have been in use from the very beginning of the present period of industrial and manufacturing development, and are satisfactorily employed at the present time according to their original significance; but the creative mechanical effort of the last 40 years has either developed or produced so great a variety of mechanical terminology has been expanded to include a much greater number of terms, which are more or less familiar to every one excepting those by whom they are habitually used in the execution of the particular line of work to which they are applicable.

Furthermore, the specializing methods of modern manufacturing systems, involving the restricted use of special terms, has not only tended to develop a class of one-sided workmen who are unquestionably skilful in their special lines of work and deplorably poor if not absolutely deficient in all other lines; but, the use of such methods has tended to increase the ever-widening gulf which separates any one class of workmen from the rest, by eliminating the necessity of a mutual knowledge of the special terms used in allied processes, by the special classes of workmen employed therein.

At the present time the number of mechanical terms amounts to several thousands. Eliminating those of a more or less fanciful character, and also those employed in individual shops, the terms having definite meanings capable of universal or wide application probably exceed 12,000 in number, the great majority of which are employed in the metal manufacturing and metal working industries.

A superficial examination of this terminology conveys the impression that a definite classification of the various terms would be either impossible or quite difficult, but a closer inspection shows that they may be very conveniently divided into several general classes

according to the character of the work, machines and structures to which they are applicable, as follows (1) Terms applicable to the processes and methods employed in the production of raw materials and rough work, and in the preparation of rough work for subsequent finishing operations, (2) terms applicable to the methods, processes and machines employed in the working of suitably prepared raw material into the form of simple articles, into the parts of complex machines and into structural shapes in general; (3) terms employed in the work connected with the preliminary and final erection of machines, engines and struc-tures; (4) terms used for the purpose of describing special forms of mechanical appliances and mechanical movements according to their held of application; (5) terms employed in operating the various classes of engines and machines; (6) general terms employed in connection with the execution of mechanical and structural engineering work, and (7) terms employed in connection with the use of the tools and appliances, and the application of the various methods and processes, in the reproductive arts

In considering the matter of the application of technical terminology it is well to prescribe marked lines of demarcation between the terms employed in connection with the different kinds of work, as for example -- between the terms applicable to mechanical work and those employed in connection with electrical work. As a rule, the distinction is quite clear, but when the terms are used for the purpose of describing appliances, devices and apparatus the line of demarcation becomes somewhat indistinct, and the precise meanings of the terms require

careful consideration. One of the most interesting examples of the varied technical application of a common term is that afforded by the use of the word "damper." It is familiarly known as a plate, valve, cover or other suitable contrivance for regulating the amount of draught in the flues of a furnace or hoiler As a specific mechanical term it is applied to the "dash-pot" or small cylinder which forms a portion of the engines of the Corliss type, in which they act as a "buffer-case" and prevent the too sudden closing of the steam and exhaust valves. As an electrical term it is applied to a metallic cylinder which is placed in such a manner that it nearly or entirely encompasses the iron core of an induction coil for the purpose of effecting a variation in the intensity of the current produced in the secondary battery. As a term employed in musical construction and operation it is applied to the strip of felt or other soft material employed in a piano-forte for the purpose of modulating the vibration of the strings.

A more varied technical application obtains in the case of the common word "pitch." used in connection with mechanical work it refers to the distance between the centres of two adjacent teeth on a gear-wheel, to the distances between bolts, rivets and boiler stays or similar parts arranged equidistantly. Also to the inclination or rake of the teeth of saws, to the angle at which a plane-iron is set on its stock and to the height or angle of a roof-truss. As an electrical term it refers to the successive corresponding conductors on the armature of a dynamo and the number of coils advanced in making end-connections between the coils of an armature winding divided into segments. It is also applied to designate the frequency of a tone vibiation produced electrically. As a musical term it refers to a succession of tone vibrations

The character of a technical term or the class of work to which it belongs is usually very clearly indicated by the textual matter on any particular subject, but in the case of mechanical and electrical terms when the distinction is not obvious, the special character of a term may be ascertained only by the nature of the power generated, controlled or applied

For further information see articles under the titles Aeronautics-Nomenclature; Terms; Aeronautics-Nomenclature; Foundry and Forge Shop Terms; Engineer-ing Terms; Electrical Terms; Locomotive, Principal Parts of; Tools; Valves; Valve Terms, and Workshop Terms, in this Encyclo-

MECHANICS ($\mu\eta\chi\alpha\nu\dot{\eta}$, a machine), or Dynamics, the science that treats of forces ($\delta \nu \mu \mu \rho$, force), and of the motions produced by them The notion of a force, as evinced to the senses as a push or pull, is common to all, but the notion of force as that which produces or destroys motion, which is the proper defini-tion of force, is modern, and is to be ascribed to Newton, the chief founder of the science It is a familiar fact that two opposite pushes or pulls may neutralize each other's effects, and thus fail to produce motion; we then speak of them as forces in equilibrium The portion of Mechanics that treats of forces in equilibrium is denoted by the term Statics (root $\sigma \tau \alpha$, stand), contrasted with which we have the subject of Kinetics ($\kappa i \nu \ell \omega$, to set moving), which deals with the effects of forces in acting to produce motion in bodies Since we can distinguish motion only in matter, the laws of motion involve the essential properties of matter, so that Dynamics is a branch of Physics - indeed, its most fundamental branch, for, until recently, it was the effort of physicists to reduce all explanations of physical phenomena to descriptions of matter in motion * Nowadays the tendency of interpreting mechanics in electromagnetic terms is making itself felt. As in geometry, instead of dealing with actual substance, we make abstraction and conceive of points, lines and surfaces apart from the substance in which they lie, so we may make abstraction and consider the motion of points, lines or geometrical configurations, quite apart from any matter or physical properties. This geometry of moving configurations or geometry of space and time is generally distinguished by the name of Kinematics (κίνημα, motion), and is included under treatments of Dynamics only for convenience, as it is impossible to make dynamical investigations except in kinematical terms.

The ancients knew but little of Mechanics,

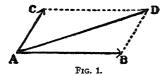
and what they did know belonged exclusively to Statics Archimedes was familiar with the principles of the lever and of the pulley. Leonardo da Vinci generalized the principle of the lever, and Stevinus (1548-1620) demonstrated the principle of the inclined plane and of the composition of forces. Varignon clearly enunciated the principle of moments, and also of the

^{*}Ultram catera natura phanomena ex principiis mecha-nicis codem argumentandi genere derivare liceret. Newton 'Preface to Principia.'

composition of forces. Galileo, in the course of his investigations on the inclined plane, came to a recognition of a particular case of the Principle of Viitual Work, which was made general by Daniel Bernoulli. These are the chief names in the development of Statics. The beginnings of Kinematics were made by Galileo, who determined the laws of falling bodies, and introduced the fundamental idea of acceleration. Huygens, in his 'Horologium Oscillatorium,' published in 1673, examined in detail the laws of the pendulum, introduced the ideas of moment of inertia, of the centre of oscillation and of kinetic energy. Most important of all was the work of Newton, who in his 'Principla Philosophiæ Naturalis' (1687), not only universalized the idea of force, and introduced the notion of mass, but laid down the exact definitions and principles from which it has never been necessary to depart. Since the work of Newton the chief names have been d'Alembert, Lagrange and Hamilton, who have given us methods of great generality and convenience, but without changing in any essential the principles laid down by Newton.

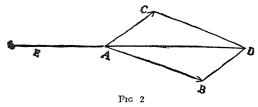
essential the principles laid down by Newton.

1 Statics—Although the principles of Statics may be logically deduced from those of Kinetics by assuming all velocities to be zero, it is simpler to follow the historical method and treat statics first, since we may dispense with the idea of time, and thus with the preliminary study of kinematics. We begin by assuming the identical nature of all forces. For instance, the effect of any force may be neutralized by a pull on a string fastened to the point at which the force is applied. The tension on a string is produced by equal and opposite pulls on its two ends, and it may be cut anywhere, if at the cut end is applied a force equal to the one previously applied to the end Such a force may be produced by the weight of any body hanging from the end of the string But as a weight always acts vertically downward, while forces may act in any direction, we may suppose the string carried over a smooth pulley with horizontal axis, whose effect is assumed to be merely to change the direction of the string without changing its tension. Thus any force in any direction may be equilibrated by the tension of a string produced by a certain weight Two forces are equal when they are equilibrated by the same weight Two weights found to be equal (by equilibration), when hung from the same string, produce double the tension produced by one, and thus forces may be measured in terms of a single weight A force having magnitude and direction may be geometrically represented by a line parallel to it, and of a length proportional to its magnitude. To this line an arrow-head may be attached to indicate the sense of the direction of



the force. We may now enunciate the principle, capable of experimental verification, that when two forces, represented by AB, AC, Fig 1, are applied at the same material point A, they may be replaced by a single force whose

the diagonal AD of the parallelogiam formed on the sides AB, AC (The direction of the principles of the parallelogiam formed on the principles of the parallelogiam formed on the principles of the parallelogiam formed on the parallelogiam formed on the sides and principles of the parallelogiam formed on direction and magnitude are represented by ple of the Parallelogram of Forces Obviously it may be replaced by the equivalent statement that if we form a triangle by placing at the extremity B of one of the lines representing the forces the initial point of the line representing the other force, BD, and complete the triangle, the line drawn from the initial point of the first to the terminal point of the second line will represent the resultant of the two forces, that being the term applied to the single force which replaces their effect. The original forces AB, AC, are said to be the components of AD. From the properties of the parallelogiam, AB sin (BAD), AC sin (CAD), so that the magnitudes of the components are inversely proportional to the sines of the angles they make with the resultant. Obviously the two forces may be equilibrated by a force equal but opposite to the resultant, so that if we draw AE equal and opposite to AD (Fig. 2) the three

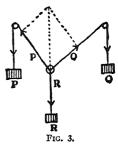


forces AB, AC, AE will be in equilibrium As the angles BAD and BAE are supplementary, their sines are equal, similarly DAC

and
$$CAE$$
; consequently we have $\frac{AB}{\sin(CAE)}$

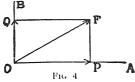
$$=\frac{AC}{\sin{(BAE)}}$$
, and in turn considering each of

the three forces as equilibrating the other two we get the theorem that the magnitudes of three forces in equilibrium are proportional to the sines of the angles lying opposite them respectively. This may be experimentally verified as in Fig. 3, where weights P, Q are hung

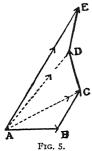


from strings passing over pulleys, and united at O to a string carrying a weight R. If a parallelogram be drawn on lengths proportional to P,Q, its diagonal will be vertical, and proportional to the weight R. A convenient form of the experiment is one in which the three strings are horizontal, and O is the centre of a horizontal circular table, on whose rim the three pulleys may be placed, their relative positions being read off on a graduation of the edge of the table.

Obviously, by a reversal of the previous process, a given force may be resolved into components in any two given directions, as only one parallelogiam can be drawn on a given diagonal, whose sides have given directions If these directions are at right angles to each

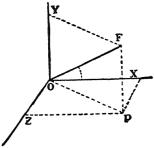


other, as in Fig. 4, OP is the component of OP in the direction OA and OO the component in the direction perpendicular thereto. The length OP is called the projection of OF in the direction OA, and we have OP -OP cos (POF). Having found the resultant of two foices applied at a common point, we may compound this resultant with another force, and so on, the simplest rule of procedure being by an extension of the triangle method above, that is, apply the initial point of each line representing a force to the terminal point of the preceding line, then the line drawn from the first initial point to the last terminal point will represent the resultant. The slightest consideration will show that the resultant is independent of the order in which the forces are compounded. This construction is known as the polygon of forces (Fig. 5). It is ob-



viously not restricted to forces lying in the same

In order to deal analytically with the composition of forces, it is convenient to assume three rectangular axes of co-ordinates, OX, OY, OZ (Fig. 6), and to resolve every force



F1G. 6.

into three components along each Thus OF may be resolved into the mutually perpendicular components OY and OP, and OP may be resolved into OX and OZ. Calling the result-

ant F, the components respectively X, Y, Z, we have

(1)
$$X = F \cos (Fx),$$

$$Y = F \cos (Fy),$$

$$Z = F \cos (Fz);$$

(2) $X^2 + Y^2 + Z^2 = I^2[\cos^2(Fx) + \cos^2(Fy) + \cos^2(Fz)] = F^2$,

since the sum of the squares of the direction cosines of any line is identically equal to unity. Since the projection in any direction of any broken line is the same as that of a straight line with the same ends, it is evident that the projection of any resultant is the same as the algebraic sum of the projections of all its components. Thus the analytical expression of the principle of the parallelogram or polygon of forces is, if F is the resultant, X, Y, Z its components along the axes,

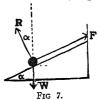
(3)
$$X = X_1 + X_2 + \dots \times n = \Sigma X,$$

$$Y = Y_1 + Y_2 + \dots Y_n = \Sigma Y,$$

$$Z = Z_1 + Z_2 + \dots Z_n = \Sigma Z.$$

Any geometrical or physical quantity which possesses direction as well as magnitude, and is compounded according to the parallelogram law, and to which the whole of the above exposition applies, is called a vector, and the preceding process is called the composition of vectors

2 A body so small that we may neglect the differences of position of its different points is called a material particle. The only principle necessary for the treatment of forces acting on such a particle is that for equilibrium the resultant of all the forces applied to it must vanish. The particle may be free or it may be subject to certain geometrical constraints, for instance, it may be obliged to move on a certain surface. Then there will be certain forces acting between the particle and the bodies causing the constraint, these forces being known as reactions due to the constraint A surface is said to be smooth if the reaction between it and a particle at rest is normal to the surface. Thus let F, Fig 7, represent a



force applied to a particle of weight W, resting on an inclined plane making an angle a with the horizontal Let F be parallel to the inclined plane. Then the three forces, W F and R, the reaction, normal to the plane, are in equilibrium. Writing these proportional to the opposite angles, as above, we obtain

(4)
$$\frac{F}{\sin a} = \frac{R}{\cos a} = \frac{W}{\mathbf{r}},$$

which determine F and R in terms of W. The same equations are obtained by resolving in the direction of the tangent and of the normal to the plane. The equation F=W sin a shows that the force required to sustain a particle on a smooth plane is to the weight of the particle in the same ratio as the height of the plane to its length, as was shown by Storinus and Galileo.

In the problem just treated, it is evident that the resultant of the applied forces W and F is opposite to R, that is, is normal to the plane Similarly for equilibrium on any smooth surface, it is necessary that the resultant of all the applied forces shall be normal to the surface, for if it had any component parallel to the tangent plane this component would move the particle along the surface Since the particle is constrained to move on a surface, there will be a relation between x, y, z, the co-ordinates of the particles, $\phi(x, y, z) = 0$, which is the equation of the surface, and since the direction cosines of the normal n are given by the equations

$$\cos(nx):\cos(ny):\cos(nz) = \frac{\partial\phi}{\partial x} \cdot \frac{\partial\phi}{\partial y} \cdot \frac{\partial\phi}{\partial z}$$

if X, Y, Z are the components of the resultant of the applied forces, we have as the condition for equilibrium

$$\cos (Fx) = \frac{X}{F} = \cos (nx)$$
, etc.,

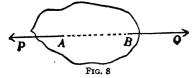
(5)
$$\frac{X}{\frac{\partial \phi}{\partial x}} = \frac{Y}{\frac{\partial \phi}{\partial y}} = \frac{Z}{\frac{\partial \phi}{\partial z}}.$$

If the surface is not smooth, the reaction between the particle and the surface is not normal, but there is a tangential component which is called friction The force of friction is peculiar in that it cannot produce but only hinder motion, and in having its direction determined as opposite to the direction in which the other forces tend to make the particle move. The law usually assumed governing friction is that when motion is just about to take place the friction, or tangential component of the reaction, is proportional to the normal component, the factor of proportionality being a constant for two given substances, such as those composing the particle and plane, as above Suppose that in the problem of the inclined plane the force F is the force of friction. Then we have $F = \mu R$, where μ is a constant for the given particle and plane called the coefficient of friction. Equations (4) then give

$$F=R \tan \alpha = \mu R$$
, $\mu = \tan \alpha$,

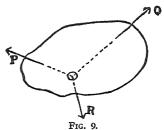
when the particle is just about to slide down. If the plane is any steeper than the value of a thus given, equilibrium is not possible. This angle is called the angle of friction

3 Let us now consider a rigid body, that is, one composed of a continuous distribution of matter having the property that the distance between any two of its points is invariable, no matter to what forces it is subjected It is evident that if equal and opposite forces, P and Q, Fig. 8, be applied to such a body at



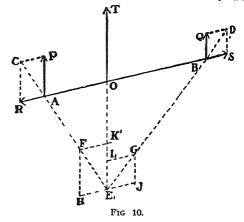
two points A and B such that the line AB has the direction of the forces, no motion will be produced, for reasons of symmetry with respect to AB Equilibrium is also independent of the position of B on the line AB.

Consequently the force Q might be applied at A, where it might be compounded with P, giving a vanishing resultant. The principle that any force applied to a rigid body may be considered as applied at any other point in its line of direction is known as that of the transmissibility of force. As an application, if the lines of direction of three forces, P, Q, R (Fig. 9), intersect in a common point Q, they



may be transferred to that point, and if they satisfy the conditions for the equilibrium of forces applied to a material particle, they will produce equilibrium of the rigid body

Suppose we have two parallel forces P and Q applied at any points A, B, of a rigid body, (Fig. 10) If we apply at A and B any two



equal and opposite forces AR, BS, in the direction of AB, equilibrium will not be affected. Compound these respectively with AP, BQ, and transfer the resultants AC, BD, to the intersection of their lines of direction E and there resolve them into components in the original directions. From the equality of the parallelograms EKFH and APCR, ELGI and BQDS, the components EI and EH are equal and opposite, so that there remain only the components EK and EL, in the same direction, equal to the given forces AP, BQ, respectively. Thus the resultant of two parallel forces in the same direction applied to a rigid body is a force in the same direction equal to their sum. Obviously it may be considered as applied at any point O in the line EK. Suppose O to lie on AB. By similar triangles $AP = \frac{OE}{AR}$, $\frac{BQ}{BS} = \frac{OE}{BO}$, and by division, since

AR = BS, $\frac{AP}{BQ} = \frac{BO}{AO}$. Thus the distance of the intersection of the line of direction of the re-

sultant with AB from A and B is inversely proportional to the forces applied at those points This is the principle of the lever, as known to Archimedes

If the forces P and Q are the weights w_i , w_i , of two particles, placed at AB, the point Qis called the centre of granty of the two particles. It is also called the weighted mean point of points AB with the weights 201, 702 If we project the points A, B, O upon the coordinate axes, the projections of AO, BO, are in the same ratios as the lengths themselves: consequently if their co-ordinates are respectively x_1 , y_1 , z_1 , x_2 , y_2 , z_2 , x, y, z,

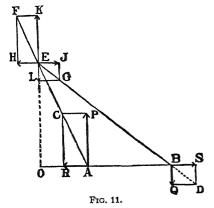
$$\frac{\overline{x} - x_1}{x_2 - \overline{x}} = \frac{\overline{y} - y_1}{y_2 - y} = \frac{\overline{z} - z_1}{z_2 - \overline{z}} - \frac{m_2}{m_1},$$

or

By a generalization, we obtain for the centre of gravity of any number of points, or the resultant of any number of parallel forces,

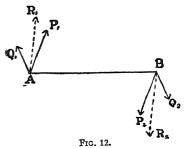
(7)
$$\bar{x} = -\frac{\sum mx}{\sum m}, \bar{y} = -\frac{\sum my}{\sum m}, z = -\frac{\sum mz}{\sum m}.$$

If the two forces AP, B(), are in opposite directions, instead of Fig. 10 we have the construction of Fig. 11, and the resultant is evi-



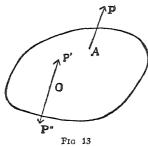
dently equal to the difference of the two components, while the point O lies outside the segment AB. We may say that in general the resultant is equal to the algebraic sum of the components. In Fig. 11, if AP and BQ are made more nearly equal, the point O recedes to a greater distance, and in the case of equality, when we have AC parallel to BD, O must be infinitely distant. The same result is given by the formulæ (6), putting $m_1 + m_2 = 0$. In other words two equal parallel and other In other words, two equal, parallel and oppositely directed forces applied to a rigid body cannot be replaced by a single resultant. Such a pair of forces is called a couple. The perpendicular distance between the two lines of direction of the members of the couple is called its arm. The product of the magnitude of either force by the arm of the couple is called the moment of the couple. The plane of the couple is the plane containing both

forces. We have shown that a couple cannot be equilibrated by any single force, but it may be by another couple This couple may be chosen in an infinite variety of ways It may easily be shown by drawing the members of the second couple as about to be prescribed, and compounding the forces two and two, by the rules already given, that the equilibrating couple may be equilibrated by any of the following, and that the given couple may accordingly be replaced by: 1° An equal and parallel couple in any plane parallel to its own; 2° An equal couple in its plane turned about its point of symmetry; 3° A couple in the same place having different arm and forces but the same moment. Thus all that characterizes a couple is the magnitude of its moment and the direction of the normal to the plane of the couple. The couple then behaves like a directed quantity, and may be symbolized by a line in the direction of the normal to its plane, whose length gives the magnitude of the moment. That couples are also compounded by the vector law is easily seen, for consider for forces of the two couples to be applied at two points AB in the line of intersection of their two planes. This can be done by bringing the couples to have the same arm. Let P_1 P_2 (Fig. 12) be the members of one couple, Q_1Q_2 those

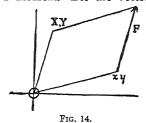


of the other. Compound P_1Q_1 by the parallelogram law to R_1 , P_2Q_2 to R_2 . These being equal, parallel and oppositely directed, form a couple which, having the same arm as the original couples, has its moment proportional to R, that is, found by the parallelogram construction. If lines are laid off perpendicular to the three planes of AB and P, Q, R, respectively, and proportional to the three moments, they will also follow the parallelogram law. Thus, a couple may be represented by a vector Thus a couple may be represented by a vector perpendicular to its plane. This vector we shall speak of as the couple, and shall disregard the resolution into two separate forces.

Let us now consider the effect of any num-Let us now consider the effect of any number of forces applied at various points of a rigid body. At any point O (Fig. 13) apply two equal and opposite forces P'P'' equal and parallel to a force P applied at A. We thus have the force P' equal to P applied at O instead of at A, together with the couple PP''. Similarly all the forces applied at O by introducing may be considered applied at O by introducing may be considered applied at O, by introducing in each case a couple. All the forces at O may be compounded into a single resultant, and all the couples into a single couple. Thus the resultant of any number of forces applied to a rigid body is a single force together with a single couple. Evidently the resultant force does not depend upon the position of the point O, while the resultant couple does. In order to have equilibrium, both the resultant force and the resultant couple must vanish



In order to express these conditions analytically, we must find an expression for the moment of a vector about a given point, that is, the product of the magnitude of the vector by the length of the perpendicular dropped upon it from the given point. This moment is thus numerically equal to the area of the parallelogram formed with the given point as one corner and the given vector as one side. As plane areas may be projected on other planes by multiplying by the cosine of the dihedral angle between them, which is equal to the angle between their normals, it is evident that the area of the parallelogram, and hence the moment, may be represented by a vector perpendicular to its plane, as already shown for the moment of a couple. Thus it is only necessary to find expressions for the three projections of a moment. Let the vector F (Fig.



14), with components X, Y, be applied at a point having the co-ordinates x, y. Its moment about the origin is equal to the area of a parallelogram having as adjacent sides lines drawn from the origin to points x, y and X, Y. This area is equal to xY-yX. But this is the projection in the XY-plane of the area of the parallelogram on the lines from O to points x, y, z, and X, Y, Z. It therefore represents the Z-component of the required moment. Similarly the three components are obtained

ponents are obtained
(8) L=yZ-zY, M=zX-xZ, N=xY-yXThe moment of a couple is the sum of the moments of its two members, and if X, Y is applied at x_1 , y_1 , X, Y at x_2 , y_2 , we obtain for the moment of the couple $x_1Y-y_1X-x_2Y+y_2X=(x_1-x_2)Y-(y_1-y_2)X,$ which evidently does not depend on the

 $x_1Y - y_1X - x_2Y + y_2X = (x_1 - x_2)Y - (y_1 - y_2)X$, which evidently does not depend on the choice of the origin, but only on the vector F and the relative position of the two points of application, since only differences of x_1x_2 , y_1y_2 appear. The analytical statement of the conditions

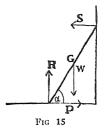
for equilibrium of a rigid body is then

$$\Sigma X = 0, \quad \Sigma Y = 0, \quad \Sigma Z = 0;$$

$$\Sigma (yZ - zY) = 0, \quad \Sigma (zX - xZ) = 0,$$

$$\Sigma (xY - yX) = 0,$$

the first three expressing the vanishing of the resultant torce, the last three the vanishing of the resultant couple. These principles suffice for the treatment of all problems concerning the equilibrium of a rigid body. For example, the extended principle of the lever follows from the theory of moments. Consider now the problem of a ladder standing on a smooth floor and leaning against a smooth wall (Fig. 15). The resultant of the weights



of all the parts of the ladder is a single force W applied at the centre of gravity G. Besides this we have to consider the normal reactions R and S. Resolving vertically we find for equilibrium W-R. O. Resolving horizontally there must be a force to balance S. Let this be P, applied at the lower end of the ladder. Then P-S. O. This does not determine the value of P or S, but we may do this by taking moments about any point in the plane of the figure. If we choose the lower end of the ladder, P and R will have zero moment, and if I is the length of the ladder, α the inclination,

Sl sin $a - (Wl \cos a)/2 - 0$, $S = \frac{1}{2}W\cot a$. If the floor is rough, and P the friction, $P = \mu R = \mu W = S = \frac{1}{2}W\cot a$, $\mu = \frac{1}{2}\cot a$, and if a is less than the angle determined by this equation, the ladder will slip down

4 All the principles of statics are compised in the Principle of Virtual Work. The conception of work is equally important with that of force. Work is done when the point of application of a force moves, the amount of work being defined as the product of the magnitudes of the force and the distance moved by the cosine of the angle included by them. If F denote the force, D the displacement, the work is FD cos (FD). This geometric or scalar product of two vectors (not a vector, since it is not associated with direction, but merely with a number, or scalar) defined as the product of either by the projection on it of the other, is of much importance in our whole subject. The cosine of the angle between two directions is given by the symmetric function of their direction cosines.

 $\cos (FD) = \cos (Fx) \cos (Dx) + \cos (Fy) \cos (Dy) + \cos (Fz) \cos (Dz).$ Now if the projections on the axes of co-ordinates of the two vectors are

$$F_x = F \cos (Fx), \quad F_y = F \cos (Fy),$$

$$F_z = F \cos (Fz),$$

$$D_x = D \cos (Dx), \quad D_y = D \cos (Dy),$$

$$D_z = D \cos (Dz),$$

we have

(11) $FD \cos (FD) = F_x D_x + F_y D_y + F_z D_z$ as the analytic expression for the scalar product. If one of the vectors is taken as of unit length,

the expression (11) gives us the value of the projection F_s of any vector F on any direction s,

(12)
$$F_3 = F \cos(Fs)$$
 $F_x \cos(sx) + F_y \cos(sy) + F_z \cos(sz)$.

It is easily proved that the work of the resultant of two forces in a displacement is the sum of the works of the components
In the case of an infinitely small displace-

ment dr, dy, ds, the work is

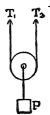
$$dW = F_x dx + F_y dy + F_z dz,$$

and if the point is moved along a curve the whole work is

(14)
$$W = \int (F_z dx + F_y dy + F_z dz),$$

where x, y, z, F_x , F_y , F_z , are supposed given in terms of some parameter, so that the integration along the curve can be performed

If some of the points of a system are not free, but constrained, a virtual displacement is one that is consistent with the constraints. Virtual work is work done in a virtual displacement. The Principle of Virtual Work states that in a system of forces in equilibrium the work done in an infinitesimal arbitrary this principle to a number of simple cases first, two equal weights P hanging from a string over a fixed pulley are in equilibrium. If the system is displaced one weight falls as much as the other uses. For the one that falls the displacement is in the direction of the force, and the work is positive and equal to PD For the one that rises the displacement is opposite to the direction of the force, and the work is negative and equal to — PD. The sum of these two quantities thus vanishes In the case of a weight hanging from a movable pulley (Fig. 16), if the string on the left is



Frg. 16.

pulled up a distance D, the force T_1 does the positive work T_1D ; but from the geometry of the case the weight P rises a distance of D/2and the weight W accordingly does the negative work—PD/2. The whole work is zero, if T=P/2. But this is the condition of equi-



Fig. 17.

librium as found by resolution, since the tensions T_1 and T_2 are equal and we must have $T_1+T_2-P=0$. Consider a lever (Fig. 17)

carrying the weights P, Q at distances l_1 , l_2 from the fulcrum. Then for equilibrium the principle of moments gives $Pl_1=Ql_2$ But if the lever be turned through an infinitesimai angle α , the end A moves a distance downward $D_1 = l_1 a$ and the weight does the positive work Pl_1 a, while the end B rises a distance $D_2 = l_2 a$, whole work is zero if $Pl_1 = Ql_2$ a The whole work is zero if $Pl_1 = Ql_2$, which is the condition for equilibrium. In the case of the inclined plane (Fig. 7), if the particle is displaced a small distance of the particle is displaced as small distance of the particle is displaced as small distance. placed a small distance d up the plane, the force F does the work Fd The weight W does the negative work -Wd sin α , since its direction makes an obtuse angle with the displacement The reaction does no work, since it is perpendicular to the displacement whole work is therefore zero if F=W sin α . But this is the condition of equilibrium The principle of virtual work is particularly convenient, since it enables us to leave the reactions out of account, since they do no work when the displacements are virtual As a further example let us consider the equilibrium of a particle whose co-ordinates are x, y, z on a surface $\phi(x, y, z) = 0$, under the action of forces whose resultant is X, Y, Z, omitting the reaction. Since the displacement is virtual, we must have $\phi=0$ during the displacement, so that

(15)
$$d\phi = \frac{\partial \phi}{\partial x} dx + \frac{\partial \phi}{\partial y} dy + \frac{\partial \phi}{\partial z} dz = 0.$$

The principle of virtual work says that for equilibrium

$$(16) Xdx + Ydy + Zdz = 0$$

for any virtual displacement, that is, one in which dx, dy, dz are not independent, but satisfy (15). Multiplying (15) by an undetermined factor λ and adding to (16), we have

(17)
$$\left(X + \lambda \frac{\partial \phi}{\partial x}\right) dx + \left(Y + \lambda \frac{\partial \phi}{\partial y}\right) dy + \left(Z + \lambda \frac{\partial \phi}{\partial z}\right) dz = 0.$$

Both conditions are satisfied 1f we determine λ so that

(18)
$$X + \lambda \frac{\partial \phi}{\partial z} = Y + \lambda \frac{\partial \phi}{\partial y} = Z + \lambda \frac{\partial \phi}{\partial z} = 0,$$

or eliminating λ ,

(19)
$$\frac{X}{\frac{\partial \phi}{\partial x}} = \frac{Y}{\frac{\partial \phi}{\partial y}} = \frac{Z}{\frac{\partial \phi}{\partial z}}.$$

But this is the condition (5) that the resultant is normal to the surface, and in fact only in this way can there be equilibrium, according to the definition of a smooth surface

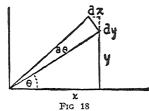
For a rigid body, a possible displacement is one in which all the points receive equal and parallel displacements, so that dx, dy, dz are the same for all. We then have

(20)
$$\Sigma (Xdx + Ydy + Zdz) = d_{x}\Sigma X + dy\Sigma Y + dz\Sigma Z = 0.$$

If this is to be true for arbitrary values of dx, dy, dz we must have

$$\Sigma X = \Sigma Y = \Sigma Z = 0,$$

which are three of the conditions for equilibrium already found A second possible displacement of a rigid body is one in which it is turned through an angle $d\theta$ about the Z-axis Let us introduce polar co-ordinates, so that



 $x = r \cos \theta$, $y = r \sin \theta$ Then in the rotation, r being constant,

$$dx = -r \sin \theta \ d\theta = -y \ d\theta, dy = r \cos \theta \ d\theta = x \ d\theta,$$

$$dz = 0$$

Consequently the virtual work is
(22) $\Sigma(Xdx+Ydy+Zdz)=d\theta\Sigma(xY-yX)$.

If this is to vanish whatever $d\theta$ we must have
(23) $\Sigma(xY-yX)=0$

But this is one of the conditions for equilibrium (9) already found, and the two others are similarly found by rotating about the other axes

Suppose now that we have any number of points $x_1, y_1, z_1, \ldots x_n, y_n, z_n$, acted on by any forces, $X_1, Y_1, Z_1, \ldots X_n, Y_n, Z_n$, and subject to any number of constraints,

Then the equation of virtual work,

(25)
$$\sum_{r=1}^{r=n} (X_r dx_r + Y_r dy_r + Z_r dz_r) = 0,$$

must hold for any changes of the co-ordinates which satisfy the conditions,

$$d\phi_{1} = \sum_{r=1}^{r=n} \left(\frac{\partial \phi_{1}}{\partial x_{r}} dx_{r} + \frac{\partial \phi_{1}}{\partial y_{r}} dy_{r} + \frac{\partial \phi_{r}}{\partial z_{r}} dz_{r} \right) = 0$$

$$(26) \quad \dots \qquad \dots \qquad \dots$$

$$d\phi_{k} = \sum_{r=n}^{r=n} \left(\frac{\partial \phi_{k}}{\partial x_{r}} dx_{r} + \frac{\partial \phi_{k}}{\partial y_{r}} dy_{r} + \frac{\partial \phi_{k}}{\partial z_{r}} dz_{r} \right) = 0.$$

Multiplying these equations in turn by multipliers $\lambda_1, \ldots, \lambda_k$, and adding to (25),

(27)
$$\sum_{r=1}^{r=n} \left[\left({}_{|X_r} + \sum_{s=1}^{s=k} \lambda_s \frac{\partial \phi_s}{\partial x_r} \right) dx_r + \left(Y_r + \sum_{s=1}^{s=k} \lambda_s \frac{\partial \phi_s}{\partial y_r} \right) dz_r + \left(Z_r + \sum_{s=1}^{s=k} \lambda_s \frac{\partial \phi_s}{\partial z_r} \right) dz_r \right] = 0,$$

which is satisfied for all virtual values of dx_1 , ... dx_n , if we take

(28)
$$X_{r} + \sum_{s=-1}^{=k} \lambda_{s} \frac{\partial \phi_{s}}{\partial x_{r}} = 0,$$

$$Y_{r} + \sum_{s=-1}^{s=-k} \lambda_{s} \frac{\partial \phi_{s}}{\partial y_{r}} = 0, \quad r = 1, 2, \dots n.$$

$$Z_{t} + \sum_{s=-1}^{s=-k} \lambda_{s} \frac{\partial \phi_{s}}{\partial z_{r}} = 0.$$

From these equations, eliminating the k multipliers λ_1 , λ_k , we have 3n-k equations of equilibrium

5 KINEMATICS -- Let us now consider questions of motion. The velocity of a point is defined as the limit of the space Δs described by it to the time of description Δt , when both decrease indefinitely.

(29)
$$v = \frac{\lim_{\Delta t \to -0} \frac{\Delta s}{\Delta t}}{\Delta t} = \frac{ds}{dt}$$

Since displacements are compounded as vectors, the resultant of a displacement AB (Fig 1), and another BD being AD, if the two displacements take place in the same time, the velocities are also proportional to the three lines, so that velocities are vectors, compounded by the parallelogram Accordingly a velocity may be represented by its components along the co-ordinates axes. Its direction being that of the tangent to the path, its direction cosines are those of the tangent

$$\frac{dx}{ds}$$
, $\frac{dy}{ds}$, $\frac{dz}{ds}$ Consequently, its components are

(30)
$$v_{x} = v\frac{dx}{ds} - \frac{ds}{dt}\frac{dx}{ds} = \frac{dx}{dt},$$

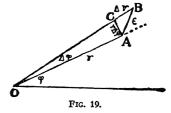
$$v_{y} = v\frac{dy}{ds} = \frac{ds}{dt}\frac{dy}{ds} = \frac{dy}{dt}, \quad v_{z} = v\frac{dz}{ds} = \frac{ds}{dt}\frac{dz}{ds} = \frac{dz}{dt}$$
Also

(31)
$$v^{2} = v_{x}^{2} + v_{y}^{2} + v_{z}^{2}$$

$$= \left(\frac{dx}{dt}\right)^{2} + \left(\frac{dy}{dt}\right)^{2} + \left(\frac{dz}{dt}\right)^{2} = \left(\frac{ds}{dt}\right)^{2}.$$

Similarly, the projection of a velocity in any direction is the velocity of the projection of the point on a line having that direction

If a point moves in a plane it may be convenient to introduce polar co-ordinates r, ϕ .



If the point moves from A to B (Fig. 19), a distance As in the time At, dropping a perpendicular AC upon the radius OB, the displace-

ment may be resolved into AC and CD, equal to $rd\phi$ and dr respectively, and accordingly the velocity may be resolved into the components in those directions

(32)
$$v\phi = \frac{\lim}{\Delta t} \frac{r \Delta \phi}{0} \frac{r \Delta \phi}{\Delta t} r \frac{d\phi}{dt}, v_r - \lim_{\Delta t \to 0} \frac{\Delta r}{\Delta t} = \frac{dr}{dt}.$$

(33)
$$v^2 = v\phi^2 + vr^2 - r^2 \left(\frac{d\phi}{dt}\right)^2 + \left(\frac{dr}{dt}\right)^2 \cdot \left(\frac{ds}{dt}\right)^2$$
,

as may also be seen from the expression for the arc in polar co-ordinates. The components or and vo are called the tadial and tangential components of the velocity respectively, while

 $\frac{d\phi}{dt}$ is called the angular velocity of the radius

The area of the triangle OAB being $\frac{1}{2} rd\phi$,

the radius vector sweeps over area at the

rate
$$\frac{dS}{dt} = \frac{1}{2}r^2\frac{d\phi}{dt}$$
, but since the area is also equal

to one-half the product of AB by the perpendecular on it from O, then we find this rate of area description to be equal to one-half the moment of the velocity about O. Using the formula (8) for moment of a vector we have

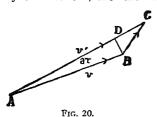
(34)
$$\frac{dS}{dt} = \frac{1}{2}r^2\frac{d\phi}{dt} \qquad \frac{1}{2}(xv_y - yv_1) - \frac{1}{2}\left(x\frac{dy}{dt} - y\frac{dx}{dt}\right),$$

which may be easily verified by passing directly from rectangular to polar co-ordinates

6 If the velocity of a point varies we define the acceleration as the limit of the increment of velocity to the time in which it takes place. We may consider the numerical change,

(35)
$$\lim_{\Delta t \to 0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt} \qquad \frac{d^{n}s}{dt^{2}},$$

or the vector change If AB (Fig. 20) denote the velocity at a time t, AC the velocity at



the time $t + \Delta t$, the vector increase of velocity is BC, and the acceleration is the limit of the ratio of BC to Δt . Obviously it may be resolved into any components, which are the corresponding components of BC each divided by Δt . In the triangle ABC, since the velocities AB and AC have the directions of the tangents to the path at the respective instants the angle between them is the angle d au between the two consecutive tangents. It is obvious that the direction of the infinitesimal side BC may be anything whatever, and that accordingly the direction of the acceleration is totally unrelated to that of the velocity, that is of the tangent to the path. Resolving along the axes, we find for the components of the accelerations

(36)
$$a_x = \frac{dv_x}{dt} = \frac{d^2x}{dt^2}$$
, $a_y = \frac{dv_y}{dt} = \frac{d^2y}{dt^2}$, $a_z = \frac{dv_z}{dt} = \frac{d^2z}{dt^2}$,

from which

(37)
$$a^{2} = \left(\frac{d^{2}x}{dt^{2}}\right)^{2} + \left(\frac{d^{2}y}{dt^{2}}\right)^{2} + \left(\frac{d^{2}z}{dt^{2}}\right)^{2}.$$

Since the direction cosines of the tangent are the same as those of the velocity, v_x/v , v_y/v , v_z/v , we may use the formula (12) to resolve the acceleration along the tangent

(38)
$$a_{\tau} = (a_x v_x + a_y v_y + a_z v_z)/v$$

$$= \left(\frac{d^2x}{dt^2}\frac{dx}{dt} + \frac{d^2y}{dt^2}\frac{dy}{dt} + \frac{d^2z}{dt^2}\frac{dz}{dt}\right) \int \frac{ds}{dt}$$

 $= \left(\frac{d^2x}{dt^2}\frac{dx}{dt} + \frac{d^2y}{dt^2}\frac{dy}{dt} + \frac{d^2z}{dt^2}\frac{dz}{dt}\right) \int \frac{ds}{dt}$ But differentiating equation (31) and comparing with (38), we find

$$(39) a_{\tau} = \frac{d^2 \varsigma}{dt^2}.$$

Thus the rate of increase of the numerical velocity is equal, not to the whole acceleration, but to its tangential component This we call the tangential acceleration, and it is equal to the limit of DC (Fig 20), divided by At The normal acceleration is easily obtained from the figure as the limit of BD divided by At. But in the figure we have $BD = AB d\tau = vd\tau$, so that the normal acceleration,

$$a_{\nu} = v \frac{d\tau}{dt}$$

Also, if ρ is the radius of curvature of the path, $ds = \rho d\tau$.

(41)
$$a_{\nu} = \frac{v}{\rho} \frac{ds}{dt} = \frac{v^2}{\rho}$$

The normal acceleration is always directed toward the concave side of the path, and is

called the centripetal acceleration

We will now consider some of the most im-portant cases of acceleration. If the motion is rectilinear, the velocity and the acceleration have always the same direction, but may vary in magnitude and in sign. After uniform motion, in which the velocity is constant and the acceleration zero, so that equal spaces are described in equal times, the simplest case is that of constant acceleration,

$$\frac{d^2s}{dt^2} = a = \text{const.}$$

Integrating we obtain

$$\frac{ds}{dt} = at + b,$$

where b is a constant representing the velocity when t=0. Integrating again,

$$(44) s = \frac{1}{2}at^2 + bt,$$

where s denotes the space described since t=0 Thus if the particle start from rest (b=0), it describes spaces proportional to the squares of the times of description. It was found by Galileo that bodies fall toward the earth according to such a law, and that in a given locality the value of the acceleration is the same for all bodies. The value of this acceleration of gravity is generally denoted by g. Comparing the velocity attained by a body

falling from rest with the height, we obtain, by (43) and (44),

(45)
$$v = gt, h = \frac{1}{2}gt^2, v^2 = 2gh$$

Conversely, if a body he thrown upwards with a velocity v, it will reach the height h

If we consider the motion of a body under gravity, but possessing a horizontal velocity as well as a vertical component, since there is no horizontal acceleration the horizontal velocity v_{τ} is constant. Calling the vertical distance fallen z, the horizontal distance traversed x, we have

$$z = \frac{1}{2}gt^2, x = v_x t,$$

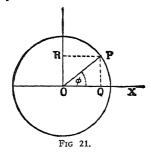
and eliminating t we have the equation of the path, $z = \frac{1}{2} \frac{gx^2}{v_x^2}$, representing a parabola with

the axis vertical. The velocity at any point and its inclination to the horizontal are found from

$$v_z = gt = \sqrt{2gz}$$
, $v^2 = v_z^2 + v_z^2$, $\tan \alpha = v_z/v_z$.

If, on the other hand, the particle be projected upward with velocity v at an angle a with the horizontal, it will describe the same parabola, rising to the vertex in the time t and falling on the symmetrical half. This problem was also solved by Galileo

Consider a particle revolving with constant velocity v in a circular path of radius r. Then since s = vt, by (39) we find that the tangential component of the acceleration vanishes. The normal component is given by (41) as v^2/r . Thus the acceleration is constant in amount and always directed toward the centre. It is to be observed that although the numerical velocity is constant, the vector velocity is constantly changing its direction, hence the acceleration is not zero, but is perpendicular to the velocity. If we resolve the uniform circu-



lar motion into components parallel to given directions, for instance, if P (Fig 21) is projected into Q and R lying on the axes OX, OY, and if P revolves with constant angular

velocity $\omega = \frac{d\phi}{dt}$, we have $\phi = \omega t$, $OQ = r \cos \phi$ = $r \cos \omega t$, $OR = r \sin \phi = r \sin \omega t$. The rectilinear motion of either Q or R is called simple harmonic motion, or a simple vibration. It is evidently periodic, that is, it repeats after the

interval $T = \frac{2\pi}{\omega}$. The number of vibrations in

unit of time, or the frequency, is $\frac{1}{T} = \frac{\omega}{2\pi}$. Since the acceleration of P is constant in magnitude,

and always in the direction PO, its component along OX varies as $\cos \phi$, that is, as the distance OQ. In other words, a point describing a simple harmonic motion has an acceleration proportional to its displacement from the centre of symmetry, and directed toward it. We may also consider harmonic motion analytically. If the acceleration is proportional to the displacement but opposite in direction, we shall have

$$\frac{d^2s}{dt^{\gamma}} - -\omega^2s,$$

where ω is a constant. The integral of this differential equation is

(47)
$$s - A \cos \omega t + B \sin \omega t = a \cos(\omega t - a)$$

where A and B are arbitrary constants and $\Lambda^{z-}a\cos\alpha$, $B^{z-}a\sin\alpha$. The constant a is called the *amplitude*, while the angle a, called the *phase*, depends simply upon the instant adopted from which to count the time By taking for a the values 0° or 90° we obtain either $a\cos\omega t$ or $a\sin\omega t$.

If we compound two simple harmonic motions in lines at right angles to each other, if the amplitudes and periods are the same and the phases differ by a right angle, the previous construction shows that we obtain uniform circular motion. If the amplitudes and phases do not have this relation, we have

(48)
$$x = a \sin (\omega t - a)$$

$$- a(\sin \omega t \cos a - \cos \omega t \sin a),$$

$$y = b \sin (\omega t - \beta)$$

$$- b (\sin \omega t \cos \beta - \cos \omega t \sin \beta).$$

Solving for sin ot and cos of

(49)
$$\sin \omega t = \left(\frac{x}{a} \sin \beta - \frac{y}{b} \sin a\right) / \sin (\beta - a),$$

$$\cos \omega t = \left(\frac{x}{a} \cos \beta - \frac{y}{b} \cos a\right) / \sin (\beta - a).$$

Squaring and adding we eliminate t and obtain the equation of the path,

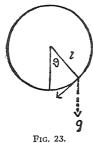
(50)
$$\frac{x^2}{a^2} + \frac{y^2}{b^2} - 2\frac{x}{a} \frac{y}{b} = \sin^2(\alpha - \beta),$$

which represents an ellipse The motion is called *elliptic harmonic motion*. The ellipse is evidently inscribed in a rectangle of sides 2a, 2b (Fig. 22), and according to the values of $a-\beta$ may have any shape, reducing to a straight line when $a-\beta$ is zero or 180° . If the two harmonic vibrations are not of the same period, the resulting path belongs to a system of curves associated with the name of Lissajous. They may be easily constructed point by point, but the elimination of t will be possible only if the periods have a common measure.



Suppose a particle subject to the constant acceleration of gravity to be constrained to

move in a vertical curcle of radius l (Fig. 23) The component of the acceleration g in the direction of the tangent is $-g \sin \theta$, while the distance moved from the bottom of the circle



We thus have the differential equais 10. t1011

(51)
$$\frac{d^2s}{dt^2} - l\frac{d^2\theta}{dt^2} - g\sin\theta.$$

The solution of this equation requires elliptic functions, but it θ is small enough we may neglect the difference between the angle θ and its sine, so that the equation of motion is

$$\frac{d^{n}\theta}{dt^{n}} \qquad \qquad \frac{g}{t} \theta,$$

which is the same as the equation (46) of harmonic motion with $\omega^2 = g/l$. Accordingly the small vibrations of a pendulum are harmonic,

of the period
$$T = 2\pi \sqrt{\frac{7}{g}}$$
, which is independent

of the amplitude of oscillation. The fact of this isochronism of the pendulum, or independence of the period from the amplitude, was discovered by Galileo, while the laws of umform circular and of harmonic motion, and of the pendulum, were found by Huygens

The latter also used the formula $g = \frac{4\pi i l}{T_2}$ to

determine the value of gLet us now examine the consequences of the celebrated laws discovered by Kepler as governing the motion of the planets about the sun. The first law states that the areas swept over by the radius vector from the sun to a planet in equal times are equal. Calling the area S, $\frac{dS}{dt}$ = const. But differentiating the value of $\frac{dS}{dt}$ given in (34), we find

(53)
$$2 \frac{d^2S}{dt^2} = x \frac{d^2y}{dt^2} - y \frac{d^2x}{dt^2} = xa_y - ya_x.$$

But this is the moment of the acceleration with respect to the origin, and if it vanishes, the acceleration must be directed toward the origin. The kinematical interpretation of the first law is then that the planets are accelerated toward the sun The second law states that the planets describe ellipses about the sun as a focus. The equation of a conic section referred to its focus is

$$r = \frac{p}{1 + e \cos \phi}, \quad p = a(1 - e^2),$$

where a is the major axis, e the eccentricity. Now to resolve the acceleration along the radius vector, we multiply its components a_x , respectively, by the direction cosines of the radius vector, which are $\cos \phi$, $\sin \phi$. Differentiating the equations for change of co-ordinates $x=r\cos\phi$, $y=r\sin\phi$, twice, we have

$$a_x = \frac{d \cdot x}{dt^2} = \frac{d^2 r}{dt^2} \cos \phi - 2 \sin \phi \frac{d\phi}{dt} \frac{dr}{dt}$$

$$-r \sin \phi \frac{d^2 \phi}{dt^2} - r \cos \phi \left(\frac{d\phi}{dt}\right)^2,$$

$$a_y = \frac{d^2 y}{dt^2} = \frac{d^2 r}{dt^2} \sin \phi + 2 \cos \phi \frac{d\phi}{dt} \frac{dr}{dt}$$

$$+ r \cos \phi \frac{d^2 \phi}{dt^2} - r \sin \phi \left(\frac{d\phi}{dt}\right)^2.$$

from which

(54)
$$a_r = a_x \cos \phi + a_y \sin \phi = \frac{d^2r}{dt^2} - r\left(\frac{d\phi}{dt}\right)^2$$
.

Now by Kepler's first law,
$$2\frac{dS}{dt} = r^2 \frac{d\phi}{dt} = \text{const.} = h, \quad \frac{d\phi}{dt} = \frac{h}{r^2}.$$

$$\frac{dr}{dt} = \frac{dr}{d\phi}\frac{d\phi}{dt} = \frac{h}{r^2}\frac{dr}{d\phi} = -h\frac{d}{d\phi}\left(\frac{1}{r}\right).$$

Differentiating by

$$\frac{d^2r}{dt^2} = -h\frac{d^2}{d\phi^2}\left(\frac{1}{r}\right)\frac{d\phi}{dt} = -\frac{h^2}{r^2}\frac{d^2}{d\phi^2}\left(\frac{1}{r}\right).$$

$$\frac{1}{r} = \frac{1}{p} + \frac{e}{p}\cos\phi, \quad \frac{d^2}{d\phi^2}\left(\frac{1}{r}\right) = -\frac{e}{p}\cos\phi = \frac{1}{p} - \frac{1}{r},$$
from which

from which

$$\frac{d^2r}{dt^2} = -\frac{h^2}{pr^2} + \frac{h^2}{r^3}, \ a_r = -\frac{h^2}{pr^2}$$

Thus the fact that the path is a come section shows that the acceleration is inversely as the square of the distance from the focus. The negative sign shows that it is toward the sun.

The third law states that for different planets the squares of the times of description of the orbits are proportional to the cubes of the major axes Since 2dS/dt=h, if T is the time of a complete period hT is twice the area of the orbit.

$$hT = 2\pi ab = 2\pi a^2 \sqrt{1-e^2}, h^2 = \frac{4\pi^2 u^4}{T^2} (1-e^2),$$

(55)
$$a_r = -\frac{h^2}{pr^2} = -\frac{h^2}{a(1-e^2)} \frac{1}{r^2} = \frac{4\pi^2 a^3}{T^2} \frac{1}{r^2}$$

Now since a^3/T^2 is the same for all the planets, we see that the factor of $1/r^2$ in the acceleration is the same for all the planets. These kinematical interpretations of Kepler's laws in terms

of acceleration were given by Newton 6. Kinetics.—The whole of our experience of dynamical phenomena was summed up by Newton in his Axioms or Laws of Motion, which are as follows:

I. Every body persists in its state of rest or of uniform motion in a straight line, except in so far as it is compelled by impressed forces to change that state.

The property of persistence thus defined is called *Inertia* The law of inertia was recognized in a less definite way by Galileo, but Newton makes of it a criterion for the existence of force, and in fact implies that if a body is moving in any other way than uniformly in a

straight line, that is, without acceleration, it is acted on by a force The second law gives a positive definition of force

II Change of motion is proportional to the moving force applied, and takes place in the

direction of the straight line in which the force

In the explanation of this law, and in a corollary appended, Newton makes clear that it is intended to include the independence of effect of two simultaneous forces, and their composition by the parallelogram

In his introductory definitions, Newton states what he means by quantity of motion, to which force is proportional, namely, the product of velocity by mass, or what is now called momentum, but the motion of mass is best introduced by the third law, which is perhaps the most important, as well as original, of the three.

III To every action there is always an equal and contrary reaction, or, the mutual actions of any two bodies are always equal and oppo-

sitely directed

If the force were measured by the acceleration alone, the accelerations of the two interacting bodies would be equal and opposite; that is not the case, but they are found to be proportional, with a factor of proportionality which is found to be always the same for two given bodies, no matter how they act on each other For example, let them be connected by a string, and act on each other through its tension, or by an elastic cord whose length may vary If for symmetry we write a factor for each acceleration,

(56)
$$m_1 \frac{d^2x_1}{dt^2} = -m_2 \frac{d^2x_2}{dt^2}, \quad m_1 \frac{d^2y_1}{dt^2} = -m_2 \frac{d^2y_2}{dt},$$

$$m_1 \frac{d^2z_1}{dt^2} = -m_2 \frac{d^2z_2}{dt^2},$$

the factors m_1 , m_2 are called the masses of the bodies, and their ratio is determined by the ratio of the accelerations. Thus we may compare the mass of any body with that of a given body taken as a unit. The usual unit of mass

is the pound or the gram

By the introduction of the conception of mass and of momentum we pass from kinematics to kinetics, or dynamics proper. As long as we were concerned with one body at a time, like Galileo and Huygens, the notion of acceleration was sufficient, but when we deal with a number of bodies with mutual actions, the notion of force is necessary. The terms on either side of equations (56) represent the forces, and the equations express the third law The second law may now be stated by saying that force is the rate of change of momentum The forces generally are known in terms of the positions of the bodies, and perhaps of their velocities, and when given by their components X, Y, Z as functions of these quantities, the equations

(57)
$$m\frac{d^2x}{dt^2} = X$$
, $m\frac{d^2y}{dt^2} = Y$, $m\frac{d^2z}{dt^2} = Z$

are called the differential equations of motion

Our kinematical examples of the previous section may now be dynamically interpreted. The fact that bodies fall with a common acceleration g shows that the forces with which they are moved toward the earth, or their weights,

W=mq, are proportional to their masses The unit of force, namely, that force which produces in a pound an acceleration corresponding to an increase of velocity of one foot per of poundal The weight of each pound is accordingly q poundals. The unit generally used by scientists is the force which produces in a gram the acceleration corresponding to an increase of velocity of one centimeter per second in each second. This force is called a dyne, and the weight of a gram is g dynes, These units are called absolute units, as they do not depend on accidental circumstances of time or place, but are referred to three fundamental units, of time, length and mass, the latter two of which are preserved in concrete standards, the former is preserved in the rotation of the earth. The more familiar gravitation unit, which we have used in the section on statics, and which is the weight of the pound or gram, is not absolute, since q varies at different parts of the earth, according to the formula $g = 980.62 - 2.6 \cos 2\lambda - 000003h$ where λ is the latitude, h the height above

sea-level, and the units are the centimeter and the second. The weight of a body is accordingly variable, but its mass is invariable For $\lambda = 45^{\circ}$, at sea-level we have

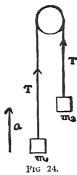
The popular usage of the term pound or gram to denote both a mass and a force is unfortunate, and should be avoided.

The fact that the weights of bodies are proportional to their masses was carefully tested by Newton by constructing pendulums of different materials, and finding that the acceleration, as determined by the time of oscillation, was independent of the substance.

The fact that a body moving uniformly in a circle has a centripetal acceleration v^2/r shows that it is acted on by a force toward the centre (centripetal foice) equal to mv^2/r If the body, for instance, be revolved in a horizontal orbit on a whirling machine, and be held in place by a string, this string may be passed over a pulley and support a weight, so that we may thus make a comparison between the absolute dynamical measure of force and the gravitational statical one previously used By repeating the experiment with another revolving mass, we may compare the masses of two bodies, by the process of comparing both with the same weight. This illustrates the dynamical comparison of masses. The usual statical method of comparison by a balance is actually a comparison of weights, and gives a correct comparison of masses because the value of q is the same at each pan. If we used a balance-beam so long that g differed sensibly at its two ends, equality of weights would not mean equality of masses.

Another simple illustration of the dynamical method of comparison of masses is furnished by Atwood's machine, by which the laws of falling bodies may be studied Two masses, m_1 , m_2 , Fig. 24, are hung from a string passage over a frictionless pulley. Since the distance moved up by one mass is equal to that moved down by the other the valorities and accelerate. down by the other, the velocities and accelerations of the two are equal and opposite. Each

mass is acted upon by two forces, the tension of the string upwards and its own weight downwards. The tension is the same for both. Con-



sequently we have for the acceleration a, $m_1a_1 = m_1a = T - m_1q,$ $m_2a_2 = -m_2a = T - m_2g,$

from which we obtain

$$a = \frac{m_2 - m_1}{m_2 + m_1}g$$
;

that is, the acceleration is to that of a body falling freely as the difference to the sum of the masses. Thus by observing the acceleration the masses may be compared. In the usual use of Atwood's machine that difference of masses is produced by an extra warrier which is taken is produced by an extra weight, which is taken off at a certain height by a fixed ring, after which the two remaining equal masses travel with uniform velocity, and by the velocity generated the acceleration is determined

The properties of harmonic motion show that a body acted upon by a force proportional to its displacement from a fixed point will execute a harmonic vibration. When a point has a position of equilibrium and is displaced therefrom, forces will in general be brought into play tending to restore it to its position, and these forces will depend upon the displacement If the displacement be small enough, the forces will be approximately proportional to the displacement, hence the frequency of harmonic vibrations in nature. The vibration of the pendulum or of a tuning-fork are examples

From the generalization that all the planets are accelerated toward the sun with an acceleration $a = c/r^2$, where c is constant for all, Newton, putting the force equal to cm/r^2 , and seeing that the masses of the two interacting bodies, the sun and planet, must enter symmetrically, was led to assume $F = \gamma Mm/r$, and from the law of reaction this would also be the force urging the sun toward the carth. Thus he was led to the generalization of universal gravitation, namely, the statement that every mass in the universe attracts every other with a force proportional to the product of both their masses, and inversely to the square of the distance apart. (The number γ is the same for

all, depending only on the units used).

Newton tested this by comparing the acceleration of the moon due to the earth's attraction with the acceleration of a body at the earth's surface Supposing the moon's orbit to be circular, of radius r and period T, its acceleration will be by (55) $a_m=4\pi^2r/T^2$. If the acceleration

eration varies inversely as the square of the distance, at the surface of the earth, it will be

$$a_8 = a_m \frac{r^2}{R^2} = \frac{4\pi^2 r^8}{R^2 T^2}$$

where R is the earth's radius.

Now we have

 $T = 27d \ 43 \ \text{m} = 39,343 \ \text{m}$, $2\pi R = 4 \times 10^7 \ \text{meters}$, r = 60R,

from which

$$a_8 = \frac{2\pi \cdot 60^3 \cdot 4 \cdot 10^7 \text{ meters}}{(39,343 \cdot 60 \text{ sec})^2}$$

$$= 9.74 \frac{\text{meters}}{\text{sec}^2} = 974 \frac{\text{cm.}}{\text{sec}^2}.$$

This agrees well with the value of g from terrestrial observations, while more exact cal-

culations give a still better agreement

The value of the Newtonian constant, γ , or the number of dynes of attraction of two masses each of one gram, one centimeter apart, $is \gamma = 6 6576 10 - 8$

A highly important contribution was made by d'Alembert, who made it possible to reduce every problem of dynamics to one of statics. If a system of particles be not free, they cannot move under the influence of given applied forces as they would if not constrained, but the reactions will cause them to move other-wise, as in the case of the masses in Atwood's machine. For another instance, consider two bullets fastened together by a string and thrown at random into the air. If free each would describe plane curves, namely, vertical parabolas. Under the influence of the tensions of the string which causes the constraint, they describe looped or tortuous paths If we knew the actual paths and motions, we could find forces which would produce the same motions if the particles were free. These d'Alembert calls the effective forces and they are given by

$$X' = m\frac{d^2x}{dt^2}, \quad Y' = m\frac{d^2y}{dt^2}, \quad Z' = m\frac{d^2z}{dt^2}.$$

D'Alembert's principle states that the actual applied forces, together with the reversed effective sources, would form a system in equilibrium. If we express the equilibrium by means of the equation of virtual work, (25),

$$\sum_{r} \left\{ (X_r - X'_r) \delta x_r + (Y_r - Y'_r) \delta y_r + (Z_r - Z_r') \delta z_r = 0 \right\}$$

(58) $\sum_{r} \left\{ \left(m_r \frac{d^2 x_r}{dt^2} - X_r \right) \delta x_r + \left(m_r \frac{d^2 y_r}{dt^2} - Y_r \right) \delta y_r \right\}$ $+\left(m_r\frac{d^3z_r}{dt^3}-Z_r\right)\delta_{Z_r}\Big\}=0$

This equation, given by Lagrange, was made by him the basis of all dynamics. Since the reactions would of themselves form a system of forces in equilibrium, they may be left out of the equation (58) of d'Alembert's Principle. From the equation (58) we can deduce all the principles of dynamics. Suppose every particle is free, then all the virtual displacements of the dynamics of t

ments, δx_r , δy_r , δz_r , are independent, and in

order that the equation may hold for arbitrary displacements, we must have

(59)
$$m_r \frac{d^2 x_r}{dt^2} = X_r, \quad m_r \frac{d^2 y_r}{dt^2} = Y_r, \quad m_r \frac{d^2 z_r}{dt^2} = Z_r$$

But these are Newton's equations for every r

of motion.

If the particles be free or form a rigid system, a virtual displacement will be given when δx_r , δy_r , δz_r , have the same values for all the particles We may then remove these factors from the summation

$$\begin{array}{ll}
\delta x & \left(\sum_{r} m_{r} \frac{d^{2}x_{r}}{dt^{2}} - \sum_{r} X_{r}\right) \\
+ \delta y & \left(\sum_{r} m_{r} \frac{d^{2}y_{r}}{dt^{2}} - \sum_{r} Y_{r}\right) \\
+ \delta z & \left(\sum_{r} m_{r} \frac{d^{2}z_{r}}{dt^{2}} - \sum_{r} Z_{r}\right) = 0,
\end{array}$$

and if δx , δy , δz , are arbitrary, this requires

(61)
$$\sum_{r} m_{r} \frac{d^{2}x_{r}}{dt^{2}} = \sum_{r} X_{r}, \sum_{r} m_{r} \frac{d^{2}y_{r}}{dt^{2}} = \sum_{r} Y_{r},$$
$$\sum_{r} m_{r} \frac{d^{2}z_{r}}{dt^{2}} = \sum_{r} Z_{r}.$$

Now we have

(62)
$$\sum_{j} m_{r} \frac{d^{2}x_{r}}{dt^{2}} = \frac{d^{2}}{dt^{2}} \sum_{r} m_{r}x_{r} = \left(\sum_{r} m_{r}\right) \frac{d^{2}\overline{x}}{dt^{2}}$$
$$\sum_{r} m_{r} \frac{d^{2}y_{r}}{dt^{2}} = \frac{d^{2}}{dt^{2}} \sum_{r} m_{r}y_{r} = \left(\sum_{r} m_{r}\right) \frac{d^{2}\overline{y}}{dt^{2}}$$
$$\sum_{r} m_{r} \frac{d^{2}z_{r}}{dt^{2}} = \frac{d^{2}}{dt^{2}} \sum_{r} m_{r}z_{r} = \left(\sum_{r} m_{r}\right) \frac{d^{2}\overline{z}}{dt^{2}}$$

where x, y, z are the co-ordinates of the centre of mass, which obviously coincides with what in the treatment of statics has been called the centre of gravity We thus find that the centre of mass of a free system, or of a rigid body, moves as if all the forces of the system were applied at that point and all the mass were applied at that point and all the mass were concentrated there. In particular if the system is exposed to no external forces, but only to its mutual actions, since these are equal and opposite in pairs, they destroy each other. Consequently the centre of mass of such a system moves uniformly in a straight line. This applies to the solar system

Under the same conditions, a rotation about an axis is a virtual displacement Putting as in (22) δx=-yδθ, δy=xδθ, δz=0, and dividing

(63)
$$\sum_{r} m_r \left(x_r \frac{d^2 y}{dt} = y_r \frac{d^2 x}{dt} \right) = \sum_{r} (x_r Y_r - y_r X_r).$$

The quantity on the right is the z-component of the resultant moment of all the impressed forces, as in (9), (23), which will be denoted by the components L, M, N.

The quantity on the left may be written

$$\frac{d}{dt} \sum_{r} m_r \left(x_r \frac{dy_r}{dt} - y_r \frac{dx_r}{dt} \right).$$

(64)
$$H_x = \sum_{r} \left(x_r m_r \frac{dy}{dt} - y_r m_r \frac{dx_r}{dt} \right) \\ = \sum_{r} \left(x_r m_r v_{ur} - y_r m_r v_{xr} \right),$$

ir evidently the z-component of the resultant

moment of momentum of all of the particles of which the system is composed. We thus have the principle that if we constiuct a vector H having the components H_x , H_y , H_z , where

(64)
$$H_{x} = \sum_{r} (y_{r}m_{r}v_{zr} - z_{r}m_{r}v_{yr}),$$

$$H_{y} = \sum_{r} (z_{r}m_{r}v_{xr} - x_{r}m_{r}v_{zr}),$$

$$H_{z} = \sum_{r} (x_{r}m_{r}v_{yr} - y_{r}m_{r}v_{xr}),$$

in virtue of the equations

(65)
$$\frac{dII_x}{dt} = L, \quad \frac{dII_y}{dt} = M, \quad \frac{dII_z}{dt} = N,$$

the velocity of the extremity of the vector H. representing the moment of momentum of the system, is equal and parallel to the resultant moment of the impressed forces about the same point. This principle, with that of equations (61), suffices for the treatment of the motion of a rigid body. By putting all velocities equal to zero we obtain the conditions of equilibrium as in (9).

If in equation (58) we put for δ_{xr} , δ_{yr} , δ_{zr} the distance actually traversed by the various points in the actual motion in the interval dt,

$$\delta x_r = \frac{dv_r}{dt}dt, \quad \delta y_r = \frac{dy_r}{dt}dt, \quad \delta z_r = \frac{dz_r}{dt}dt,$$

(66)
$$\sum_{r} m_r \left(\frac{d^2 x_r}{dt^2} \frac{dx_r}{dt} + \frac{d^2 y_r}{dt^2} \frac{dy_r}{dt} + \frac{d^2 z_r}{dt^2} \frac{dz_r}{dt} \right) dt - \sum_{r} \left(X_r \frac{dx_r}{dt} + Y_r \frac{dy_r}{dt} + Z_r \frac{dz_r}{dt} \right) dt = 0,$$

and we may write the sum of terms containing the accelerations as an exact derivative,

$$\frac{d}{dt} \frac{1}{2} \sum_{r} m_r \left[\left(\frac{dx_r}{dt} \right)^2 + \left(\frac{dy_r}{dt} \right)^2 + \left(\frac{dz_r}{dt} \right)^2 \right] = \frac{dT}{dt}.$$

The quantity T whose derivative appears, which is one-half the sum of the products of the mass of each particle by the square of its velocity, is the very important quantity called the kinetic energy Integrating equation (66) between the limits t_0 and t_1 ,

(67)
$$T_1 - T_0 = \sum_{r} \int_{t_0}^{t_1} (X_r dx_r + Y_r dy_r + Z_r dz_r),$$

where T_0 and T_1 denote the values of T at the respective instants t_0 and t_1 .

The integral on the right is the work (14) done by all the applied forces during the motion We thus obtain the principle that the increase of kinetic energy of a system is equal to the work done by the forces. Suppose now that the system be taken from one given configuration, where all the co-ordinates have given values, to a second, where they have other values at the co-ordinates have given values. given values, the particles describing given paths, and they then be taken from the same initial configuration to the same terminal one, but by other paths. Two cases are to be considered Either the work done by the forces depends upon the paths, or it is independent of the paths, depending only on the terminal configurations. If the integral

$$\int_{t_0}^{t_1} (X_r dx_r + Y_r dy_r + Z_r dz_r)$$

does not depend upon the path, it can be shown

that every component of every force is the partial derivative of a single function — W of all the co-ordinates, by the corresponding

(68)
$$X_r = -\frac{\partial W}{\partial x_r}, \quad Y_r = -\frac{\partial W}{\partial y_r}, \quad Z_r = -\frac{\partial W}{\partial z_r}.$$

$$\sum_{r} \int_{t_0}^{t_1} (X_r dx_r + Y_1 dy_1 + Z_1 dz_r) = W_0 - W_1,$$

and the equation (67) becomes $T_1 - T_0 = W_0 - W_1$

$$T_1 - T_0 = -IV_0 - W_1$$

or (69)

$$T_1 + W_1 - T_0 + W_0$$

The sum of the two functions T+W is then constant during the motion. As T is called the kinetic, W is called the potental energy of the system. Such systems are called conservathe systems, and the above principle is called the principle of the Conservation of Energy The motion of energy is of the greatest importance in dynamics The principle was first used by Huygens and was generally stated by John and Daniel Bernoulli.

As an example of a conservative force we may take gravity. For a single particle we have W = mgz (z being measured upward), so that the equation of energy is

$$\frac{1}{2}mv^{2} + mgz = \text{const.} = \frac{1}{2}mv_{0}^{2} + mgz_{0},$$

$$v^{2} - v_{0}^{2} = 2g(z_{0} - z) = 2gh.$$

Accordingly the velocity attained by a falling particle does not depend on the form of the path, but only on the height fallen. This was known to Galileo, for bodies falling along the inclined plane or the arc of a circle. All forces acting according to the Newtonian law are also conservative.

We have now stated in summary fashion the principal theorems of *Mechanics*. The scope of this article does not permit us to enter into the details of the various methods which arise for treating the more complicated problems, say of the motion of a rigid body. By means of the equations (65), however, we may form an idea of some of the properties of such motions. We have seen that the centre of mass moves as if the whole body were concentrated and all the forces applied there. To find the motion of rotation we have to investigate the moment of momentum of a rigid body. If the body rotate about an axis with angular velocity do, we obtain the velocity of a point at a distance r from the axis by differentiating the equations $x = r \cos \theta$, $y=r\sin\theta$,

$$v_x = -r \sin \theta \frac{d\theta}{dt} = -y \frac{d\theta}{dt}, \quad v_y = r \cos \theta \frac{d\theta}{dt} = x \frac{d\theta}{dt},$$

and the moment of momentum is

$$H_z = \sum_r m_r (x_r v_{yr} - y_r v_{xr}) = \frac{d\theta}{dt} \sum_r m_r (x_r^2 + y_r^2).$$

The quantity $K = \sum_{rmr} (xr^2 + yr^2) = \sum_{rmr} r^2$ is called the *moment of inertia* of the body with respect to the axis. Suppose the axis is horizontal, and the body influenced only by gravity. The resultant of the weights of all the martiales of the body in face. We may be a supposed to the supposed t particles of the body is a force W = Mg applied at the centre of mass, which is, say, at a distance h from the axis, the plane through it and the axis making an angle θ with the vertical.

Then the moment of all these forces about the axis is $N = Mgh \sin \theta$, and we have the equation of motion

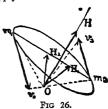
(70)
$$\frac{dH_z}{dt} = K \frac{d^2\theta}{dt^2} = -Mgh \sin \theta.$$

This is the same as that of a simple pendulum of length l = K/Mh, which is called the length of the equivalent simple pendulum at a distance l from the axis and in line with it and the centre of mass is called the centre of oscillation. This problem of the so-called compound pendulum was solved by Huygens, who also showed that if the body be suspended from a parallel axis through the centre of oscillation the period would be the same.

If a rigid body move in any manner with one point fixed, it may be shown that its mo-tion at any instant may be described as a rotation with a certain angular velocity about a certain axis. All the particles of the body are then moving in various directions tangent to circles with planes parallel to each other, but owing to lack of symmetry the direction of the resultant moment of momentum has no simple relation to the direction of the axis.

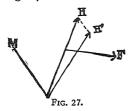


As the motion goes on the direction of the axis changes in the body, and so does the direction of the moment of momentum. Thus the phenomenon is a complicated one, and can be dealt with only by lengthy analysis. If, however, the axis of rotation is an axis of symweiry, as in the case of the axis of a symmetrical top, Fig. 25, it is evident that the particles may be grouped in symmetrical pairs, m_1 , m_2 , Fig. 26, so that the moments of momentum H_1 , H_2 about the fixed point O will be symmetrical pairs. rical with respect to the axis, and the resultant moment will be in the direction of the axis. If then we apply to the axis a force F (Fig. 25),



it will have a moment M (Fig. 27), perpendicular to the plane of F and the fixed point, and according to equations (65) this will be the direction in which the vector H will move toward H'. The end of the axis will, therefore, move at right angles to the direction in which it is pulled. This is the basis of the explanation of the curious phenomena of all tops and gyroscopes. In the ordinary top, the weight

acting downwards at the centre of mass produces a horizontal moment; the point of the top accordingly begins to move horizontally, causing a movement of precession. When the precession begins, the rotation is no longer



about the axis of symmetry, and the vector H no longer coincides with the geometrical axis of the top, but the end of the vector H always travels in a horizontal plane, and the axis of the top moves about it in a motion of so-called nutation. The rotary motions of the planets are explained in a similar manner. It has recently been demonstrated by Einstein that the classical, Newtonian mechanics presented here is only a first approximation to the facts discrepancies between the Newtonian and the Einsteinian mechanics are due to the fact that time and space, as ordinarily conceived, are not independent dimensions of being. See RELATIVITY, PRINCIPLE OF.

Bibliography.— The following treatises may be consulted for a more detailed treatment. For the whole subject: Love, 'Theoretical Mechanics': Thomson and Tait, 'Treatoretical Mechanics': Thomson and Tait, 'Treatise on Natural Philosophy'; Webster, 'Dynamics'; Ziwet, 'Theoretical Mechanics'; Minchin, 'Treatise on Statics'; Kent, R. W, 'Fundamental Mechanical and Electrical Laws' (1921); Prescott, J., 'Mechanics of Particles and Rigid Bodies' (2d ed 1923); Bird, G W, 'Mechanics for Engineering Students' (3d ed. 1938) · Boyd, J. E., 'Mechanics' (1930); Millikan, R. A., and others, 'Mechanics, Popular Molecular Physics, Heat and Sound' (Boston 1937).

ARTHUR GORDON WEBSTER. MECHANICS OF DEVELOPMENT OR EVOLUTION. A term applied by Ger-MECHANICS man embryologists and biologists to the changes coincident with the reproduction, fertilization and later growth of organisms. In the organic world, living bodies are constantly undergoing changes of state, these changes being most con-spicuous during the period of embryonic development. The changes in the conditions of life together with heredity and selection have caused the evolution of the world of plants and animals. These changes have been complex, and yet in every way have been made with exactness, order and regularity, and the larger knowledge of development mechanics has in a great measure been due to the researches of Pander, Lotz, Born, Wilson, Loew, Ryder, Wyman, Driesch and others. Probably the most noteworthy treatments, though of opposing schools, are those of Von Wilhelm Roux, 'Programm und Forschungsmethoden der Entwichlungsmechanik der Organismen leichverstandlich dargestellt' (Leipzig 1897), and of Dr. Oscar Harting (Triangle 1897), leichverstandlich dargestellt' (Leipzig 1897), and of Dr. Oscar Hertwig, 'Zeit- und Streit-fragen der Biologie: Mechanik und Biologie' (Jena 1897). Nature does for man in the organic what he has to effect in the inorganic world, and it is only necessary that he observe

these changes to be able to state a series of relations of antecedent and consequent. See LIFE; GROWTH; KINETOGENESIS.

MECHANICS' INSTITUTES. The establishment of mechanics' institutes marks the struggle of the artisan to provide for his own education. Denied a technical education, unable to take advantage of college and university education because of financial and economic stress, the artisan nevertheless demands for himself such educational opportunities as he can use during his free hours. His needs are peculiar. His range of interests is prescribed by his trade or vocation, his time is limited, his preparation is likewise limited and variable. His demands cannot be satisfied, therefore, by conventional methods and equipments special organization must be set up Mechanics' institutes are a distinctive product of England, no other country having developed an equal number of such organizations. Nor are such institutions characteristic of any other national educational scheme. The reason for this is the conservatism of English universities and higher educational institutions generally. The artisan was not provided with a systematic training beyond the fundamentals of his trade as given by a more or less definite apprentice system. Industrial education and manual training were not made a part of public education until late in the 19th century. Hence the necessity for the artisan to devise a scheme for educational extension into his adult years, an education that would meet his specific needs. Birmingham and Glasgow were the pioneers in developing educational opportunities for mechanics. In Birmingham Sunday lectures in mechanics and in the physical sciences were given as early as 1789. An "Artisan Library" was maintained. Glasgow organized its Mechanics' Institute in 1823. This is probably the first use of the term. The London Mechanics' Institution was founded in the same year and was under the leadership of Dr. Birkbeck, who had been instrumental in the maintenance of the work in Birmingham Liverpool followed with its Mechanics' and Apprentices' Library in 1825. Other cities followed and in 1839 a Metropolitan Association of Mechanic's Institutions were formed; in 1848 a similar association known as the Yorkshire Union was formed with 86 institutions as members.

The range of work became wider as the movement grew. The Manchester Mechanics' Institute announced its purpose to be "to enable artisans of whatever trade to become acquainted with such branches of science and art as are of practical application in their trade" The subjects offered either by lecture or class instruction were as follows: natural philosophy, science, natural history, literature, writing, grammar, composition, algebra, geometry, drawing, music, French, German, Latin. This is indicative of the scope of the work attempted.

The aim of the mechanics' institutes was to bring education within reach of the middle and lower classes in England. The programs show that it was an effort to give as much of the traditional content of education as these classes could assimilate. It was education given to mechanics, but much of it was not about mechanics nor yet about industry or closely related matters Herein lies the explanation for the decline of the movement. The institutes failed to hold their clientèle as the artisans lacked the necessary educational background. But out of and on these foundations have grown the highly efficient technical schools which are in successful operation to-day

grown the highly efficient technical schools which are in successful operation to-day
Mechanics' institutes were also established in the United States, notably in Boston, Philadelphia, New York and Rochester, N. Y. A few are still in successful operation. It is notable that they are taking an important part in the development of vocational and industrial education (q v) in the United States. With free public schools, especially free State colleges and State universities, giving extensive courses in the mechanic arts and in the sciences, there is less demand for these private institutions with their special appeal to the mechanics' interests. Their function has been that of the pioneer. They have blazed the way for engineering and technical schools and are now doing the same for vocational and trade schools. See Education, Industrial, Education, Tectinical, Manual Training, Cooper Union; Vocational Education

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MECHANICS' LIENS, in statute law, a lien or claim upon real estate to secure payment for work or labor performed on, or materials furnished for, buildings or other im-provements thereon; which labor or material has been furnished at the request or with the consent, express or implied, of the owner of such real estate or other property. In early English law lands were charged with liens by express agreement of the owner and were generally covered by mortgages Courts of equity also recognized mortgage agreements By statute other liens were created, including judgment liens and liens for taxes and assessments. In the United States the increasing number of independent contractors who constructed buildings on contract, and of dealers in building material, resulted in the enactment of numerous mechanic lien laws. Such laws have also been enacted in Canada, but not in Great Britain. The statutes hold that the value of real estate is increased by the addition of improvements and that the property should accordingly be held subject to such claims. Mechanics' liens are valid prior liens over all other claims, such as mortgages, judgments or taxes, and the term covers all claims for labor, whether skilled or unskilled, and for all building materials fur-nished. But liens are held against the property and not personally against the owner The lien and not personally against the owner only attaches to the very property upon which the work was done, and has no effect on other pieces of real estate of the owner. In most States the law provides that the work to which the owner is entitled under a contract must be entirely performed before the contractor can file a lien, but where owners' payments are made in instalments, some codes permit the filing of a lien when the owner defaults in the payment of an instalment. Liens usually take precedence according to the time of their filing in the county clerk's office In some States subcontractors, who have not had direct dealings with the owner, may nevertheless file liens against the property for the work performed by them.

The statutes of mechanics' liens vary in the different States in the manner of details, time of filing, method of procedure, etc, and State statutes should be consulted See LIEN; MORTGAGES

MECHANICSBURG, Pa, borough in Cumberland County; alt 430 feet, 8m SW of Harrisburg; on the Pennsylvania Railroad It is located within a farming area raising fruits, field crops, and hay, and there are clay pits near by. Industrial products are shirts, pajamas, silks, automobile wheels, flavoring extracts, and structural steel. The place was settled in 1790, and was called Drytown (from the scarcity of water) until 1828, when it was incorporated and renamed, the new name observing the number of mechanics employed in its machine shops Pop. (1930) 5,647; (1940) 5,709

MECHANICSVILLE, Battle of (also called battle of Beaver Dam Creek). After the battle of Oak Grove (qv), 25 June 1862, the Army of the Potomac was thrown upon the defensive by the sudden appearance of "Stonewall" Jackson on its right North of the Chickahominy McClellan had but one corps in position, that of Fitz-John Porter, temporarily strengthened by McCall's division of Pennsylvania reserves McCall held the extreme right vania reserves McCall held the extreme right of the line at Mechanicsville and Beaver Dam Cicek, with three brigades and five batteries of His main position was along the east bank of the creek, a tributary of the Chicka-hominy, and was very strong, his left resting on the Chickahominy, his right and advance extending to a body of woods near and overlooking Mechanicsville, held by a regiment and a battery. Rifle-pits had been constructed for the infantry, epaulments had been thrown up to cover the guns and a strong picket-line was in front from Mechanicsville Bridge to Meadow Bridge along the Chickahominy A. P. Hill's Confederate division and Cobb's Legion were in plain view from the left, intrenched on the opposite side of the Chickahominy About noon of the 26th Hill's men were seen in motion. At 1230 the Union pickets at Meadow Bridge were driven in, and McCall formed line; Reynolds' brigade on the right, covering the crossing of the road from Mechanicsville to Bethesda Church; Seymour on the left, covering at Ellerson's Mill the crossing of the road from Mechanicsville to Gaines' Mill; and Meade's brigade, with two batteries, in reserve. A. P. Hill had 14,000 men in his division, which he had concentrated near Meadow Bridge, under orders from General Lee to co-operate with Jackson, who was marching from Ashland to turn McClellan's right. Hill sent Branch's brigade and a battery to cross the Chickahom-iny seven miles above Meadow Bridge and communicate with Jackson's advance, and when Jackson had crossed the Virginia Central Rail-road, Branch was to cross the Chickahominy, push down the river and uncover Meadow Bridge, which Hill was to cross at once and then sweep down to Mechanicsville, uncovering in turn the Mechanicsville Bridge, which Longstreet's and D H. Hill's divisions were to cross, when all were to push down the left bank of the Chickahominy and cut off Mc-Clellan's communications with his base at White House on the Pamunkey, and thus force him to abandon his operations against Richmond and

retreat down the Peninsula Jackson was behind his appointed time, and it was 10 o'clock before Branch and it was 10 o'clock before Branch opened communication with him Hill grew impatient as the hours went by and nothing was heard from Branch or Jackson, and at 3 P.M. put his five brigades and six batteries in motion. Field's brigade seized Meadow Bridge and crossed, closely followed by the brigades of J R Anderson and Archer The brigades of Gregg and Pender then crossed and marched across the country to support the right of the attacking column Field's advance was met by a severe artillery fire, but, forming line, with Pegram's battery in the centre, it forced the Union advance of a regiment and battery from Mechanicsville back to the main line beyond Beaver Dam Creek. It had not been General Lee's intention to attack McCall in position, but to have Jackson turn it. Jackson was not up in time; McClellan would doubtless penetrate his design and make a counter-attack against Richmond; time was everything; the day was declining, and Lee ordered A P. Hill to attack The brigades of Field, Archer and Anderson were ordered to advance on the Mechanicsville road against Reynolds. They were met by a withcring fire of artillery and musketry and were bloodily repulsed, though one of Anderson's regiments on the left succeeded in making a temporary lodgment beyond the creek Parts of Porter's corps now came up and strengthened Reynolds' right. Following the repulse on the left, Pender's brigade and Ripley's of D H. Hill's division made a most determined attack upon Seymour at Ellerson's Mill, but a mill-race, swampy ground and other obstacles were in their way, and Seymour's direct and Reynolds' flank fire checked and then repulsed them with great loss. The attack was renewed, and a still more bloody repulse was the result, some of the regi-ments losing all their field officers and half their men. It was now sunset, and no further their men. It was now sunset, and no further effort was made to assault the position, but the firing was kept up until 9 p.m. On the next morning McCall was ordered to fall back to Gaines' Mill (qv) The Union loss was 49 killed, 207 wounded and 105 missing The Confederate loss, killed and wounded, was over 1,500; Longstreet says between 3,000 and 4,000 killed, wounded and missing, which is probably excessive. Longstreet further says: "Next to Malvern Hill, the [Confederate] sacrifice at Beaver Dam was unequaled in demoralization Malvern Hill, the [Confederate] sacrifice at Beaver Dam was unequaled in demoralization during the entire summer "Consult Alexander, 'Memoirs of a Confederate' (New York 1907); Ropes, 'Story of the Civil War' (ib. 1907); Steele, 'American Campaigns' (Washington 1909); 'Official Records' (Vol. XI); 'McClellan's Own Story'; Webb, 'The Peninsula'; Allan, 'History of the Army of Northern Virginia'; The Century Company's 'Battles and Leaders of the Civil War' (Vol II).

E. A CARMAN.

MECHANICYILLE, N. V. city, in Saran

MECHANICVILLE, N. Y., city in Saratoga County, alt. 105 feet, on the Hudson River, the state barge canal system, the Delaware and Hudson and the Boston and Maine railroads, and state and federal highways; by rail, 19m. N. of Albany. The surrounding region is agricultural. Both railroads serving the city have shops there. Paper, bricks, knit goods, and dairy products furnish the bulk of the city's output. Mechanicville has a public library, good

public buildings, and musical and literary organizations. Settled in the early 1700's, the villaginas incorporated in 1859. Incorporation as a city occurred in 1915. The city has commission government. The water-supply system is under public ownership; the power and light systems are privately owned. Pop. (1940) 7,449.

MECHANISM, or the MECHANICAL THEORY, in its most general significance, means the relation of a limited number of invariable substances to each other in such a way that they vary in their relations according to invariable laws. More specifically it means the explanation of phenomena by the universal laws of matter in motion. It is closely connected with the attempt to resolve bodies into their simplest elements and to explain their qualities as due to uniform laws of connection and interaction among these elements. The mechanical theory has usually been held in connection with some form of atomism Since the aim of this kind of explanation is to reduce qualitative determinations to quantitative and me-chanical relations of elements, these elements have usually been conceived to possess only such qualities as were necessary to explain the empirical qualities, the ideal being to find a single homogeneous element possessing only the characteristics essential to corporeity The term mechanical is also used in a looser sense, though still within the limits of the general definition given above, to describe any explanation which regards all the qualities of a body as due to the mere summation of the qualities of its parts; eg, a mechanical theory of society.

Mechanism as a Theory of the World.— As a philosophical theory, mechanism is the attempt to regard the entire universe as a closed system of causes and effects in which every change is ultimately reducible to a change of motion. In this sense, therefore, it is practically synonymous with materialism (q,v)

Mechanism as a Method of Explanation. - After the Middle Ages the development of the new science, at the hands of Copernicus, Kepler and Galileo (qq.v.), and many of their contemporaries, depended very largely on the application to nature of the method of mechanical explanation. Francis Bacon (1561-1626) (q.v), by his opposition to the use of teleology in scientific explanation, did much to bring about the acceptance of mechanism, and it was firmly established as the true scientific method of dealing with nature by Descartes (1596-1650) (q v.), who, though not an atomist, still denied to matter all but quantitative characteristics and defined the method of science as strictly mechanical. Even the physical phe-nomena of living bodies (everything in the world, in fact, except the res cogitans in man) he regarded as capable of a purely mechanical explanation. From this time on mechanism became the recognized method for natural science, and consequently it soon became an urgent philosophical problem to discover a satisfactory way of reconciling the mechanical conception of nature with a teleological and idealistic conception of the universe. Thus Leibniz (1646-1716) (q.v.), while admitting the necessity of reducing all natural phenomena to motion, held that ultimate reality consists of an infinity of centres of force (monads), which he conceives as in some sense analogous to minds. Accordingly, metaphysical explanation must be in terms of teleology, though mechanism is the sole valid explanation of the phenomenal manifestation of reality in nature. A similar conception, having its historical origin in Leibniz, was held in the 19th century by Lotze (1817-81) (qv), who proclaims the purpose of his philosophy to be "to show how absolutely universal is the range of mechanism, and at the same time how completely subordinate the significance of the function which it has to fulfil in the structure of the world" ('Microcosmus,' Introduction) Kant also regards the mechanical categories as the sole valid means of scientific explanation. The causal category is, for him, rigorously constitutive of our experience and hence is determinant of our conception of all objects in the world of experience; teleology, on the other hand, though a necessary means of regulating our investigations of organized matter, remains a merely subjective principle which can give no insight into the origin of any being. When we deal with objects which "cannot be thought by us, as regards their possibility, according to the principle of mechanism," we may treat them cas if" they were teleologically ordered; but "nothing is gained for the theory of nature or the mechanical explanation of its phenomena by means of its effective causes, by considering them as connected according to the relation of purposes " The phenomena of the moral life, according to Kant, he outside the realm of scientific experience and hence are not subject to mechanical explanation. Since Kant's time, many thinkers, perhaps the majority, have followed him in regarding mechanism as the ultimate principle of explanation for science; thus Helmholtz, F. A. Lange, Dubois-Reymond, Clausius, Thomson, Maxwell, etc. Wundt at-tempts to find for it a logical justification as the only theory which can afford an adequate conception of natural causality. On the other hand, more recent writers, especially among physicists, have taken the opposite view. According to them, the pre-eminence of mechanical explanation is merely a dogma based on its successful use in science E. Mach, Stallo, Helm and II. Cornelius take this position These thinkers maintain that the purpose of scientific explanation is to condense into a single compact statement (e.g., a mathematical formula) a large mass of empirical data. A scientific law is merely a short-hand statement of the facts, and its value is purely economic So long as the mechanical theory affords useful analogues for the formulation of other phenomena, it is a valid scientific method. Whenever this ceases to be the case, mechanism must be superseded by a more economical theory Kant's conception of mechanism as a mode of dealing with experience has been developed by contemporary English idealism. The general problem of all rational knowledge is conceived to be the construction and maintenance of a coherent and systematic experience. In all thought, therefore, there is implied a totality which constitutes the truth. But this totality manifests itself in different categories of thought and in varying degrees of perfection. "Matter and motion are the abstractions in which the sensuous world is reduced to homogeneity in order to be susceptible of quantitations." geneity in order to be susceptible of quantitative treatment, and in this treatment they are

able to a large extent to represent genuine and actual relations of that world? (Bosanquet, 'Logic,' Vol. I, p 200) Mechanical explanation, therefore, is one form in which the unity of thought may be manifested; it is "that form of identity and difference in which an identity is regarded as the sum of the difference in which it is presented? (1b, p 201). Its value for knowledge is therefore said to be instrumental or methodological, because it is a method which thought uses in its effort to construct a rational experience. It possesses ultimate truth just in proportion to the degree of rational unity which it achieves in experience as a whole

In psychology the term mechanism is sometimes used to describe a theory which seeks to explain mental phenomena as due to the combination or interaction of simply psychic elements. This usage is an analogy with the atomic theory of matter. The classical example is Herbait (qv), who gave the term currency. According to his theory every representation has a constant quality and a variable force. These forces stand in relations of greater or less opposition and the whole state of consciousness is conceived as a resultant of all the forces involved in it. Consult Th. Ribot's (German Psychology of To-day) (Eng trans. by J. M. Baldwin, pp. 24 ff.) For mechanism in biology see Mechanism and Vitalism Bibliography.—Lange, F. A, (History of Materialsm) (Eng trans. London 1879-81. 3

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MECHANISM AND VITALISM. Newtonian mechanics has long constituted an ideal for all the natural sciences on account of the elegance of its form and the clearness of its definitions. There has consequently been a tendency to reduce biology as well as chemistry, astronomy, optics, etc, to a mechanical basis and to explain all biological phenomena in terms of motions of particles. This tendency is known as mechanism, and those who follow it are called mechanists. Now, a living oganism, even from the purely mechanical side, is of the greatest complexity and intricacy of structure Practically all organic tissues are colloidal in nature, and the physics and chemistry of even a simple colloid are as yet very imperfectly understood. Furthermore, the most minute observable portion of living tissue is far from being a simple colloid, but manifests a distinct and highly complicated structure. As a consequence, all mechanical explanations of living processes are bound to be of an extremely sketchy nature Now, the actions of animals and plants are subject to fairly simple descriptions in terms derived from our own consciousness. When a spider catches a fly, we seem to render that fact intelligible to ourselves by saying that it wants to eat the fly. As a consequence, our biology as it exists is permeated through and through by anthropomorphic concepts, such as purpose, desire, sensation, etc. While the mechanists claim that, as far as the scientist is concerned, all the facts ordinarily described through the mediation of these concepts are susceptible to a correlation in a fashion which, though purely mechanical, is too complicated for our own human faculties to grasp, there are others, the so-called vitalists,

who deny this possibility

The vitalists may either discover a peculiar purposive, anthropomorphic force active in biological matters alone, as does Driesch, or they may, like Bergson, regard the purposive account of the world as everywhere prior to the mechanical account. They draw their arguments from certain processes which, like the regeneration of lost parts, or the adaptation of the individual to the environment by mutation, appear peculiarly fitted for purposive explanations involving some prevision of the future These processes they regard as not merely non-mechanical, but counter to the current of mechanism, involving either indeterminism, or determination through factors which have no mechanical correlates.

The paucity of the fruits of purely mechanical research in biology is obvious; on the other hand, the methods of the vitalist are generally so crude and his definitions so vague that there is no great body of biological knowledge which has been gained from the vitalistic standpoint The terminology of vitalism abounds in such expressions as élan vital, or "entelechny," which are only defined per ignotius. In short, whether a complete mechanization of biology be possible or not, biological investigation has been fertile precisely in so far as it has subjected itself to the norms, if not to the concepts, of physical science. It would consequently seem that mechanism is methodologically correct, even if it be metaphysically wrong See also Materialism; Mechanism.

Consult Bergson, Henri, 'Creative Evolu-

tion' (New York 1911); Driesch, Ifans, 'The History and Theory of Vitalism' (London 1914); Mack, Ernst, 'Popular Scientific Lectures' (Eng. trans., Chicago 1895).

NORBERT WIENER

MECHANISMS, Mental, are modes of thought obtaining both in the unconscious and in conscious mental activity, the most important of which are identification, compensation, projection, introjection and rationalization. In earliest infancy the average individual gradually makes a distinction between self and external reality, tending to regard as himself those parts of his experience which give him pleasure and as external those parts which give him pain. He thus very early unconsciously identifies himself with certain portions of his environment. This unconscious habit of thought continues throughout life All persons constantly identify themselves with persons and things surrounding them or which come within their mental purview This has the very important result of making them regard those external persons or things as having an influence over themselves and their acts and their emotions. Thus a man who defended the actions of a celebrated physician who was con-demned and executed for murdering his wife was giving, in his defense, an illustration of identification of himself with the murderer, as

was shown later to some extent by his confession that he lived very unhappily with his wife and sympathized with the criminal who had succeeded in getting iid of his partner in Two varieties of identification are that wav distinguished, namely, the subjective form or introjection, and the objective or projection In introjection the subject accepts an idea which really has an external origin, and identifies it with some portion of his own mind, as for instance when one reads a description of some disease and infers that one has that dis-This is a characteristic of imease oneself pressionable and hypersensitive natures who feel an excessive sympathy for other people. It leads to various forms of introversion in which the individual tends more and more to live a life within himself and to become more and more unable to achieve objective success in the world Projection, on the other hand, is that objective form of identification which takes an idea which has had actually an internal origin and believes that it has an external origin. Examples of this mechanism in an excessive degree are found in the mental mulady known as paranota (q v), in which the suspicious of the individual, having a purely subjective origin, are projected upon the external social environment. The paranoiae believes that he is a great man, taking his belief from the grandiose thoughts which occur to him as a compensation [see belowl for an unconscious feeling of inferiority, and he views external reality more and more as conspiring against him to prevent the realization of his wishes for superiority. It is true that all individuals give evidence in thought and act of both introjection and projection, but it is only when these mechanisms are unduly developed that the discrepancy between the unconscious wish and the actuality become such as to render the individual obnoxious. All healthy adults identify themselves with parts of their environment to some extent, as with their possessions and with the members of their family and of their social milieu, but such identification is productive of good both in action and in thought It should not, however, be allowed to go too far, and a rigorous critique should be exercised by comparison with real things in order to prevent excess

Compensation is that mechanism of the unconscious which secures an activity sometimes quite the opposite from that found to be the goal of the unconscious wish For example when a person shows an extraordinary interest in antivivisectionism or the prevention of citielty to children or to animals, it is frequently discovered upon analysis that this form of activity is a compensation for an unconscious sadism or desire to inflict cruelty Lynching, which ostensibly aims at the punishment of an offender, is in reality mediated through an unconscious desire to inflict citielty or to see it inflicted. Much of the action of extravagant chivalry is also an illustration of an unconscious desire to indulge in acts of cruelty This is an apparent contradiction, but numerous analyses have shown the truth of this statement. The fact that a conscious and an opposing unconscious wish are satisfied both at the same time makes the compensation all the more ambigu-ous. That is, the individual consciously be-lieves that he is satisfying only the wish to right a wrong, not being conscious of the fact

that in taking especial pleasure in righting a wrong, he is unconsciously satisfying a wish to ecupy his mind with the rerong itself. It is not known to the militant suffragette that her conscious desire to arrogate to herself the privileges of men is a compensation for an unconscious desire to be dominated by a man Compensation is a physiological mechanism, too, by viitue of which the function of one organ, say the kidneys, is taken over at times by that of another, for instance the skin, in exreting certain waste products. An aim is sought by nature and failing in attaining this aim through one avenue, she tries another. Similarly in the mental processes, the psyche is aiming constantly at the satisfaction of desire, and if it tails to get it consciously, it will get it unconsciously by compensation, that is, the desire of which the individual is not aware, though it may be fundamental in his psyche, will nevertheless gain its satisfaction in some substitutive form, through something which symbolizes in conscious life the object of the meanscious craving A very infantile partial trend of the libido, (qv), namely, the child's desire to be looked at, is gratified by the actor in a domestic performance where he may be ut-terly unconscious of the fact that his primary desire is to exhibit his body but unconscious only of the fact that he wishes to represent a character for the editication of the public.

Rationalization is the constant tendency on the part of all people to give an ex post facto reason for their thoughts or acts. This is why ⁴a man convinced against his will is of the same opinion still." The term rationalization was introduced into analytic psychology by Dr. Ernest Jones. If a person is hypnotized and during the hypnotic sleep is told by the hypnotizer to do something when he wakes up, such for instance as putting a chair on a table, he will do so, and when he is asked to give a reason for this act, he will fabricate a wrong one, because he does not know the right cause. The cause of his act was the hypnotic suggestion, and is perfectly well known to the hypnotizer. But to the hypnotized subject the cause is unknown as it is contained in his unconscious, and, having been given to him in his unconscious state, it does not emerge into consciousness. This is paralleled by almost every instance in which a leason is given for doing anything. The entire cause in the case of some persons is, as with the hypnotized person, in the unconscious, while with the majority of people a large proportion of the causes of all their actions is in their unconscious and is unknown to them. The reasons which people then give for their actions are termed rationalizations and the tendency of all persons to feel that they have to give reasons when they are asked for them is what is meant by rationalization. See also Symbolism. Consult Hendrick, I., 'Facts and Theories of Psychoanalysis' (1939); Jelliffe, Smith Ely, 'Sketches in Psychosomatic Medicine) (1939).

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MECHANIZED WARFARE. See Advance Guards; Antiaircraft Guns; Armored Cars; Arms; Artillery; Coast Defense; Machine Gun; Military Aeronautics; Military Engineering; Military Science; Military Transportation; Naval Aviation;

Outposts, Military; Strategy; Tactics; Tank, Second World War

MECHANOTHERAPY, treatment of discase by mechanical means or exercise See Massage

MECHITARISTS, měk-ï-tar'ists, a sect of Armenian Christians acknowledging the authority of the Pope, but retaining their own ritual. The name originated from Mechitar Da Petro (1676–1749), who in 1701 founded a religious society at Constantinople for disseminating a knowledge of Armenian literature. They soon removed to the Morea, whence in 1715 they went to Venice, and later to the island of San Lazzaro There are branches of the sect in Vienna and elsewhere At Venice its printing presses have turned out the best works in Armenian literature, and a periodical which has a large circulation Consult Boré, 'Le couvent de Saint Lazare à Venise, etc.' (Paris 1837).

MECHLIN, mek'lin (Dutch, meh'lin), or MALINES, ma-lēn, Belgium, a city on the Dyle, 14 miles southeast of Antwerp. The an-Dyle, 14 miles southeast of Antwerp. The ancient walls and moat have been replaced by a wide boulevard and canal, the streets are wide and regular and it has fine squares and public buildings. It is the see of the primate of Belgium and has numerous churches. The illustrious Cardinal Mercier (qv) was once primate Saint Rombold's Cathedral, a vast building covering nearly two acres, was built in 1437-52; the clock-tower, however, 324 feet high, remains unfinished; the cathedral contains Van Dyck's 'Crucifixion.' The churches of Saint Lohn and Our Lady contain works by of Saint John and Our Lady contain works by Rubens; the town hall dates from the 15th century; the Cloth Hall, now used as a guardhouse, from 1340, while also noteworthy are the modern archiepiscopal palace, the Beguinage and the Salm Inn (1534). The manufacture of pillow lace and of cloth, so famous in the 15th, 16th and 17th centuries, has been largely transferred to Brussels, the chief industries now are caipentry, caps and woolens, candles, starch, bells, tobacco, cabinet-making, brewing, horticulture and agriculture; extensive railway works have been established here. In 1914 the city was occupied by the Germans, who were later driven out by the garrison troops of Antwerp. The Germans retook the city after a violent bombardment, during which most of the city was laid in ruins. Pop. (1936) 62,246.

MECKLENBURG, měk'lěn-boorg, Germany, a territory on the Baltic Sea, a former Saxon province, now divided into the republics of Mecklenburg-Schwerin and Mecklenburg-Strelitz.

(1) Mecklenburg-Schwerin, bounded on the north by the Baltic Sea, elsewhere chiefly by Prussia and Mecklenburg-Strelitz, has an area of 5,066 square miles. The capital is Schwerin. Mecklenburg-Schwerin is watered by several rivers, most important of which are the Elbe and its tributaries, the New Elde and the Sude, on the southern border, the Warnow, the Recknitz and the Stepenitz, which flow toward the Baltic. There are many lakes and ponds, the largest of which are the Muritz See (51 square miles), the Schweriner See (23 square miles), the Schweriner See (23 square miles) the Kolpiner and the Plauer See The country is generally flat, though here and there intersected by low ranges of hills, and its surface is extensively covered with wood. Near the sea

are large tracts of sand and morass. The climate, though raw, is mild and healthful, the average temperature throughout the year is 46°

and the precipitation is 21 inches

The principal industries are agriculture, dairying and stock-raising. About 50 per cent of the population are tillers of the soil. The landholders were formerly hereditary tenants of the peasant class, title being vested in the upper classes, as the emperor or the aristocracy. The chief crops are wheat, rye, oats, bailey, corn, pease, beans, heets, turnips and potatoes, and tohacco is cultivated to some extent. The principal manufacturing industries are foundries, machine shops, brick yards, tanneries, paper mills, sugar refineries, breweries, distileries, tolacco factories, etc. There is considered. eralic commerce through Warnemunde (Rostock) and Wismar. The railway mileage is 1,094 miles. The predominating form of religion is the Lutheran. Besides the university at Rostock there are several gymnasia and numerous burgher, parochial and other schools. Under the Empire the two Mecklenburg duchies had a common assembly or Landesunion, consisting of the representatives of the landed aristocracy or Ritterschaft and the burgomasters of 49 towns, the tenants of the royal domains had no representation. The assembly met once a year, alternately at Malchin and Sternberg. The executive authority in Mecklenburg-Schwerin was vested in a cabinet of four ministers; there were also a permanent committee consisting of nine members at Rostock, who represented the two estates when the assembly was not in session, and deputation and convocation diets, which might be assembled upon special occasions and for special purposes. Mecklenburg-Schwerin had two votes in the federal council and six representatives in the Reichstag, the only elective offices. Each duchy had a separate system of lower courts but they had a Supreme Court at Rostock in common. There was no general financial budget for Mecklenburg-Schwerin; there were three entirely distinct systems of finance. The budget of the first system was called the administration of the sovereign; the second, the states administration and the third, the ordinary budget of the common administra-tion. The Constitution of the Republic is dated 17 May 1920. Technical education is well advanced and higher education is provided for by the University of Rostock. Pop. (1925) 674,411.

(2) Mecklenburg-Strelitz, divided by Mecklenburg-Schwerin into two large districts, the province, under the empire, of Stargard, and the province of Ratzeburg, both on the east, and on the west in several smaller districts, existing in separate patches, has an area of 1,131 square miles. Pop. 110,371, capital Neustrelitz. The country is flat and similar in physical characteristics to Schwerin. Under the Empire Strelitz had one joint representative chamber with Schwerin, but Ratzeburg was not included in these estates and was governed directly by the grand duke. The grand duke gave Ratzeburg a representative constitution 1869. Mecklenburg-Strelitz had one vote in the federal council of the empire and one representative in the Diet. Consult Raabe, W, 'Mecklenburgische Vaterlandskunde' (3 vols., Wismar 1896).

MECKLENBURG (měk'lěn-berg) DEC-LARATION, in American history, a series of

rebellious resolutions adopted 20 May 1775, at Charlotte, Mecklenburg County, N. C, by a convention held at midnight and representing each militia company in the county The resolutions declared that the people of Mecklenburg County were lice and independent of the British Crown, and not only was the general tenor that of the Declaration of Independence, but many phrases in the resolutions are word for word as they appear in that document. The minutes of the midnight meeting are said to have been destroyed by fire in 1800 Whether the Declaration of Independence followed the words of the Mecklenburg Declaration, or words of the Mcckienburg Declaration, or whether the latter, having probably been replaced from memory, was unctured with the former, is a disputed question. In 1831, the day of 20 May was made a legal holiday in North Carolina. Consult Cooke, 'Revolutionary History of North Carolina' (1853); Draper, 'The Mecklenburg Declaration' (1874), Graham, G. W., 'The Mecklenburg Declaration of Independence, May 20 1775,' and (Lives of the ham, G. W., The Meckenburg Declaration of Independence, May 20 1775, and Lives of its Signers' (New York 1905), Hoyt, W. M., The Mcklenburg Declaration of Independence (ib, 1907); Moore, J. II., 'Defense of the Mecklen-burg Declaration of Independence' (Raleigh 1908)

MECONIC ACID, an organic acid occurring in opium and having the formula CoHO, (OII) (COOH)2 In preparing it, the opium is exhausted with water at 100° 17, the infusion is neutralized with calcium carbonate and evaporated to a syrup, and calcium meconate is precalcium chloride. Two crystallizations from hot dilute hydrochloric acid follow, and the free acid is then deposited in the form of small scales, containing three molecules of water. Upon heating to 212° F the hydrated crystals lose their water, and become white Meconic Meconic acid is readily soluble in alcohol, but only slightly so in other and in cold water. It has a sour taste and a pronounced acid reaction, and its solutions are turned red by ferric chloride, FeCla. Meconic acid forms numerous salts ("meconates"), as well as various organic derivatives; but none of these is of importance in the arts.

MEDAL, a piece of metal in the form of a coin, stamped with a figure or device to preserve the portiait of some eminent person, or the memory of some illustrious action or event, and not to be circulated as money. Medals belong to two periods, ancient and modern, separated by a wide interval. Early Greek and Roman medals were struck for prizes in athletic games, or in commemoration of great events. The Roman series of medals or medallions is very extensive in gold, silver and brass or copper. The gold medals begin with Constantine and continue to the fall of the empire; the silver begin under Gallienus and continue as long; the copper from Augustus to Alexander Severus.

In more modern times the art of medal-making has been brought to great perfection, and most of the principal nations have adopted the plan of preserving their history by these durable monuments. The French series is deserving of special mention as the most perfect and complete in the world It commences under Louis XI and continues to the present date, illustrat-

ing every important event in the history of France The English series commences under Henry VIII, but as works of art the medals have not high rank. The British battle medals, however, form an admirable series. The Italian and German medals of modern date are very fine. The mediceval are interesting and bold in design, but rude in execution. The papal series, commencing with Paul II, are worthy of attention.

One of the eathest American medals is that presented to Gen John Armstrong for his successful attack in 1750 on the Indians at Kittanning Most of those struck during the Revolution were made in France. The next Amerolution were made in France ican medal of which there appears to be any record is that which was presented to General Gates after the surrender of Burgoyne, 17 Oct. 1777 On 25 March 1776, when news of the British evacuation of Boston reached Congress, that body resolved that its thanks be presented to the Commander-in-Chief, and that a gold medal be struck in commemoration of the event This medal was nearly two and three-quarters inches in diameter. On one side was a profile head of Washington, with the legend in Latin. "The American Congress to George Washington, the Commander-in-Chief of its armies, the asserter of freedom." On the reverse the device showed troops advancing toward a town, others marching toward the water, ships in view, General Washington in front, mounted, with his staff, whose attention he is directing to the embarking enemy. The legend is: "The enemy for the first time put to flight." Then, too, at the time of his death, among minor honors paid to the great general's memory, was the publishmg of a silver commemorative medal.

There is the record of one medal only granted by Congress in commemoration of any naval victory during the War of the Revolution, and that was a gold one presented to Paul Jones for his defeat of the British frigate Serapis when commanding the Bonhomme Richard, 23 Sept. 1779 Other gold medals were those presented to Commodore Perry and Lieutenant Jesse D. Elliot for the part which they took in the battle of Lake Erie, 8 Oct. 1812; to Captain Lawrence, who, in command of the Hornet, 24 Feb. 1813, captured the British brig Peacock; to Captain Warrington of the Peacock—then under the Stars and Stippes—for the capture of the Epervier, 20 April 1814; to Capt. Thomas Macdonough, who commanded the American squadron in Plattsburg Bay, August 1814; to Captain Decatur, who, in command of the United States, captured the British frigate Macedoman, 25 Oct. 1812; and to Captain Jones and Captain Blakely, who, when commanding the Wasp—the one, 12 Oct 1812, and the other 28 June 1814—captured respectively the Frolic

and the Reindeer from the British navy.

The giving of medals went out of fashion after the second war with Great Britain, and but little was done by the government during the War of the Rebellion. Maj. Robert Anderson received two medals for his gallant defense of Fort Sumter, but one was presented by the citizens of New York and the second by the Chamber of Commerce of the same city. After the successful operations by Grant in East Tennessee and at Chattanooga, Congress voted him thanks and a gold medal with suitable emblems, devices and inscriptions. It is worthy of re-

mark that no less than 189 medals were struck in honor of Abraham Lincoln, and later medals have been issued in memory of Garfield and McKinley, and in honor of Sampson, Schley, Dewey and others in the Spanish-American War (See also Coinage; Numismatics, Token Money). Consult Hawkins, 'Medallic Illustiation of the History of Great Britain and Ireland' (London 1885); Loubat, J. F., 'Medallic History of the United States' (New York 1878); Leduc, 'Histoire des décorations en France' (Le Mans 1890); Hill, G. F., 'Portrait Medals of Italian Artists of the Renaissance' (New York 1912).

MEDAL OF HONOR, United States Military, an honor bestowed upon army and navy officers and men for specific services; regarded as a higher token of the war hero than the Victoria Cross of England, the medal of the Legion of Honor of France, or the Iron Cross of Germany It is given not for the sheer performance of duty, no matter how hazardous that duty may be, but for some voluntary act of valor, beyond the bounds of mere obedience to orders. Out of the millions of men who have battled for the United States in the different wars this country has had, the vast majority, as history shows, performed their duty. Of these, however, have been about 2,000 men who have done more, who have braved dangers when they were not expected to brave them, over-come difficulties that were regarded by the rest as insurmountable, and faced death when it seemed it meant the sacrifice of their own lives. Many are the ways these medals have been won. By the Act of 12 July 1862 the United States government authorized the striking of 2,000 medals to be given to non-commissioned officers and privates for gallantry in action and soldier-like qualities On 3 March 1863 the sum of \$20,000 was appropriated for making the medals, and officers were made eligible to receive Medals were also authorized by Congress in recognition of acts of bravery performed during the World War and the war with Spain in 1898 (in the naval battles of Manila and Santiago, the Manila medals bearing the portrait of Admiral Dewey, and the Santiago medals a portrait of Rear-Admiral Sampson) The medal is a bronze five-pointed star within a circle suspended from a cross bar inscribed with the word "Valor" and surmounted by an eagle, united by a ribbon of 13 stripes of red, white and blue. Consult Rodenbough. Uncle Sam's Medal of Honor' (New York 1866), and 'United States Army Regulations' (latest issue).

MEDAL OF HONOR LEGION, an association of officers and enlisted men of the United States army, who were awarded medals of honor for special acts of bravery and devotion. At first limited to participants in the Civil War, it was subsequently extended to all medal holders. The association has altogether about 400 members among the army veterans and among naval veterans. The meetings are held annually.

MEDALLION, mē-dăl'yŏn. (1) The term medallion in numismatics is applied to those productions of the mint of ancient Rome, or struck in the provinces under the empire, which, if gold, exceed the aureus in size; if silver, the denarius; and if copper, the first or large brass. Medallions are not numerous. Those struck in

the Greek provinces are more common than the Roman, but of inferior workmanship. A beautiful and famous gold medallion exists of Augustus, and one of Domitian, but few, in any metal, are found prior to the reigns of Hadrian and Antoninus; those in biass are the largest, many of them being several inches in diameter, and for the most part of admirable workmanship. (See Medal).

(2) In architecture, an oval panel carved in bas-relief, usually carrying a head or figure. The same term is used for a color design

MEDANO, mā-da'nō, the Spanish name for peculiar moving sand-hills in Peru They are seen on the plain of Islay near Arequipa, and are crescent-shaped bodies of white sand, which move across the desert in the direction of the winds which blow from sunrise to sunset. The sand composing the medano seems different from the desert sands over which the moving mass is blown or carried

MEDARY, Samuel, American editor and politician b Montgomery Square, Montgomery County, Pa, 25 Feb 1801; d. Columbus, Ohio, 7 Nov. 1864 In 1825 he settled at Batavia, Clermont County, Ohio, and in 1828 established the Ohio Sun in support of Jackson's candidacy for the presidency He sat for Clermont County in the State house of representatives in 1834-35 and was a member of the State senate in 1835-37. In 1837 he purchased at Columbus the Western Hemisphere, later the Ohio Statesman, which he edited until 1857 In 1857-58 he was governor of Minnesota Territory and in 1858-59 of Kansas Territory He was named Minister to Chile in 1853 but declined. He established the Crisis at Columbus in 1860, and was its editor until his death. He gave active aid to Morse in the promotion of the electric telegraph, was a firm supporter of the measures of Jackson and Douglas; is said to have originated the battle-cry "Frity-four forty, or fight!" in connection with the Oregon boundary dispute, and was often called the "old wheel-horse of Democracy" There is a monument to his memory at Columbus, Ohio.

MEDEA, me-dé'a, a powerful sorceress of the Greek heroic age, daughter of Æetes, king of Colchis. By some her mother is said to have been Idyia, daughter of Oceanus; by others Hecate or Neæra. By her profound knowledge of the magical virtues of plants she practised witchcraft She became the wife of Jason (qv.), the leader of the Argonauts. For 10 years she lived with him after having supported him in every danger, till the charms of Glauce, or Creusa, the daughter of King Creon, kindled a new passion in him, and he discarded Medea, who brooded on revenge. With this purpose she sent the bride, as a wedding gift, a poisoned garment, also a poisoned crown of gold, which Glauce put on and died in agony. The sorceress reduced Creon's palace to ashes by a shower of fire, murdered her two children by Jason and then mounted her dragon chariot and escaped Some say that she went to Hercules, others to Athens, to King Ægeus, by whom she had Medus. From Athens also she was banished as a sorceress. She finally returned to her home, where her son Medus reinstated her father, who had been dethroned by his brother Perses, after which she died. The story of Medea has often been a subject of

tragic poetry ancient and modern. The tragedies of this name, by Æschylus and Ennius, have perished, as well as the Colchides of Sophocles The Medeas of Euripides and Seneca are alone extant. The story has also been dramatized by Corneille and Gullparzer. Cherubini made this myth the subject of an opera Consult Lubker, F, 'Reallexikon des plassischen Altertums' (8th ed., Leipzig 1914), and Mallinger, Léon, 'Médée étude sur la litterature comparée' (Paris 1898).

MEDEA, The, a play of jealousy and revenge, in which the interest is sustained from the beginning to the very end, and is artistically almost without a flaw, was brought out by Euripides in 431 BC. Few tragedies of ancient or modern times are more dramatic. None exhibit the working of a fiercer and more intense passion. With the 'Hippolytus' it forms the double summit of the poet's works, and probably no Greek tragedy has been more famous in the modern world. The great enchantress, who fell in love with Jason when he came to Colchis in quest of the Golden Fleece, escapes with Jason to Greece, and lives happily with him for many years. Later Jason and his bar-barian princess are obliged to flee to Corinth. In this city the scene of our play is laid The old nurse speaks the prologue: Jason has deseited his wife for the daughter of Creon, king of Corinth. Dishonored, forsaken, the hapless woman sits brooding. The pædagogus enters and reports a conversation he has just overheard: Creon proposes to banish Medea. Medea is heard bemoaning her fate oh, that she had never listened to the smoothing words of the deceitful Greek Embittered, she imprecates curses on Jason and her children and prays that the whole house may be blasted to naught. Then she comes out and explains her position to the Coninthian women, who form the chorus. Creon cuters and orders Medea to get her gone. She dissembles: the king is mistaken in believing that she is dangerous—she is simply hot with hate against Jason "Let me remain—I shall yield to the stronger hand and hold my peace." The king reluctantly consents for her to remain one day. A great change comes over the woman scorned after Creon's departure. "I would not have groveled so before him except to get revenge. I shall bide my time, find first a sale refuge, then compass their destruction in secrecy by craft. Till then, my soul, sit still By the Queen of Night that habits my hearth's dark shrine, no

one shall ever vex my soul with impunity."

The choius sing: "the old order is upturned; picty and fear, religion, justice, truth, loyalty all decline to their contraries, and naught but confusion lives." Jason appears and upbraids his wife for her froward spirit; she may rail at him, but not against the king. He had tried to appease the incensed ruler, but she persisted in her folly. But he will not desert her even in this dire extremity. "O most pernicious and perfidious man! You front me, you, the most hateful, insolent wretch on earth? But I am glad you came, for I shall tell you what you are, that you may chafe and wince.—I saved you, slaying the dragon and delivering you from death. I abandoned my home and followed you. Yet now you forsake me, the mother of your children. A loyal

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spouse I have in you! I, a poor lot woman, with her two babes, a fine reproach for our newly wedded prince!" Jason feels that he must be a skilful pilot to run before the wind of her loud words, but he declares that she received more than she gave, for she lives in a good Greek land, where law and justice reign she is no longer an obscure barbarian. He had her welfare at heart when he contracted the new alliance Women are so unreasoning that they know not where their fortunes lie. Jason withdraws and the chorus sing a song on the power of love. King Ægeus of Athens enters He promises to protect Medea, if she comes to his city seeking refuge. Then she sends for Jason and asks his forgiveness for the rash words spoken in angry mood. "Ho, children, come forth and welcome your father with me" But the thought of their impending death, when she beholds her babes, is too much even for Medea's non courage The tears force themselves to her pitying eyes In explanation of her weakness she tells Jason that she is a woman, naturally born to tears, prone to weep, subject to fears, her heart melted at the thought of reconcultation. Jason has naught but praise for her altered mood; may his children grow to manhood trumphant o'er his foes Medea weeps Jason asks her why she turns her face away and hears not with joy his benisons. "Tis nothing—I bore them, bied them, loved them, and when you prayed that they might live, I wondered whether this would come to pass. She begs Jason to intercede for her children and allow them to remain in Counth — she will send his bride royal gifts. The children carry the presents in a casket to the palace The choius sing an ode and the pædagogus enters to inform Medea that the children may remain. "Be of good comfort, thy children will yet bring thee back home." "Nay, I shall first send others home. Alas! O children, you have a home, but I go to another land, just when I begin to feel that I am blest in you. Out upon my daring! 'Twas all for naught I toiled for you, my children Ah, the fond hopes that your dear hands would minister to my wants and when I die put the shroud around me. Oh, why do you look at me thus? My heart is unequal to the task. My babes' bright morning faces unnerve my arm I cannot do it I will take my children with me. Why, to wring their father's heart, give my own a double pain? But am I to be mocked? Shall I let my foes go unpunished? I must do it. Out upon my cowardice! Go in, children Nay, my heart, let them live; spare the tender babes, my unblown flowers, my life, my joy, my all the world No, by the avenging deities, I will not give up my children to my foes But I must see them before I go. O my darlings! O sweet mouth and form and face, sweet kiss, sweet embrace! O balmy breath and tender touch of your delicate cheeks! Go in, go in. I can look no longer, I faint "The choius sing an ode on the comparative benefits of having children and having no children A messenger enters: "when your children entered the palace we were all glad. The rumor spread that you were reconciled." One kissed the hands of the children, the other their flaxen hair The princess sat with fond look on Jason; but when she espied the pair, she pulled down her veil and turned away in

scorn. Jason entreated her to allay her wrath: "Accept these gifts and ask your father to remit the doom of exile, for my sake" And when she saw the splendid gifts, she granted her lord's desire. Then she took up the 10be - after they had gone - and tried it on The golden crown she placed upon her head and arranged her hair before a mirror. Then she rose and walked about the room, stepping lightly with delicate foot and glancing oft toward the lowest folds around her ankle, Suddenly a ghastly spectacle presented itself, A pallor spread o'er her face Back she tot-tered all a-tremble, and barely reached her couch before she fell, frothing foam around her lips, her eyeballs rolling wildly. One servant darted to her father's chamber, another flew to call the bridegroom. The hapless girl lay full a minute speechless. Then she roused and gave forth a scream, for a double agony had charged upon her from the inclusive verge of golden metal around her brow a marvelous stream of fire shot forth, while the robes began to eat her delicate flesh. Up she started and sped across the room, a pillar of fire, shaking hair and head in vain endeavor to cast off the But firm it held. Whene'er she shook her locks the flames started up twice as high and fierce O'erwhelmed she sank upon the floor, past recognition save to a parent's eye: the clear calm look was gone, the comely features marred, drops of intermingling fire and blood dripped from her head, while gobbets and flakes of flesh dropped from her bones, like tears of resin from the pine, as those unseen jaws of the poisonous drug fed on her form. All feared to touch the corpse. Suddenly her father entered He knelt and clasped her in his arms: "Oh, my poor child, what god brought thee to this cruel death?" At last he stayed his tears and tried to raise his old bent form, but the robes did cling to him as the ivy to the laurel. He writhed upon his knees and tried to wrench himself away, but only pulled the flesh from off his bones. At last the illstarred sire gave up the ghost. Now their corpses lie side by side, a spectacle to draw tears of pity from the eye. Medea informs the chorus that she must slay her children and hasten away: "Now, my heart, put on thy armor for the deed Shrink not Think not on the happy days agone. For this one brief day forget thy children—e'en if thou dost slay them, they are most dear, and I the most unhappy woman in the world » Medea enters the house and soon the screams of the children are heard within, Jason enters and asks for Medea; he feels anxious for his children—the king's relatives may do them hurt. "Wretched man, your children are dead, slain by their mother's hand."
Jason is overwhelmed He orders the gates to be unbarred Medea appears aloft in a chariot. Jason asks for the bodies; but she refuses to give them up: she will take them and bury them herself, that her foes may not demolish the grave She intends to go to the land of Erechtheus to live with Ægeus. She prophesies that Jason will die most miserably, struck on the head by a piece of fallen timber from the Argo She soars away, and Jason calls on Zeus to witness the treatment he has received at the hands of the tigress. Thus the play, in which we see the perfection of Euripides' art

ends The fury of her vengeance is as the love of Phædia in the 'Hippolytus', but instead of overwhelming her soul, it excites to action, arms it against the deepest instincts of mother-love and makes it triumph over everything in a kind of grandiose and savage egoism. The more impetuous the fury, the more pathetic the struggle of feminine instincts. In no other play is there anything more characteristically Euripidean than Medea's celebrated monologue. Next to the human passions it is the natural affections, the tenderness of paients for their children, the love of brothers and sisters, of husband and wife, that Euripides portrays best.

Author of 'The Greck Tragic Poets,' etc

MEDELLIN, mā-dĕl-yēn', Colombia, a city, the capital of the department of Antioquia, and an episcopal see, picturesquely situated in a mountain valley 4,850 feet above sea-level on the Porce, an affluent of the Canca, 150 miles northwest of Bogotá It was founded in 1674 and has a cathedral, college, seminary, technical school, mint, hospital and other public buildings. The development of the gold and silver mines in the region has contributed largely to its modern progress. It has manufactures of pottery, porcelain ware, cloth, candies, cigarettes, clocks, shoes, paper and jewelry and has a considerable trade, exporting gold, silver, coffee and hides. Pop. 160,000. Consult Henao and Arrubia, 'History of Colombia' (Univ. of N. C. 1937).

MEDFIELD, Mass, town in Norfolk county, alt 179 feet, 19m. SW of Boston, on the New York, New Haven and Hartford Railroad. It is a residential suburb The public library houses historical relics Medfield was settled and incorporated in 1651 and burned in 1675 during King Phillip's War (qv) Pop. (1940) 4,384.

MEDFORD, Mass., city in Middlesex County, alt. 12 feet, on the navigable Mystic River; 5m. NW. of Boston, terminus of a branch of the Boston and Maine Railroad from Boston; and, through West Medford, on the Lowell division of the same railroad. A residential suburb of Boston, it has important manufacturing interests Among its products are machinery for cutting shoe soles, wax and polishes; waterproofed textiles, and valves. Medford's public library has a collection of autographed letters of George Washington. The city's educational facilities include a standard public school system and Tufts College (qv), which has, in cooperation with Harvard University, the Fletcher School of Law and Diplomacy, training students for government service and participation in the management of international relations. Lawrence Observatory, which rises to a height of 310 feet above sea level, affords a view of the surrounding country. In its early days Medford was famous for rum and ships. The special quality of Medford rum was attributed to the water used in its making. Shipbuilding began here in the first years of the nineteenth century, and prospered until the early 1870's. The distilling of rum at Medford ceased very soon after 1900. In the pre-Revolutionary years Medford was a source of supplies for New Hampshire and Vermont It was a city of merchants. Medford-built ships engaged in the China trade, and made fast

voyages around the Cape to California. Medford first known as Meadford, was settled in the 1630's, incorporated as a town in 1684, and made a city in 1892. Its government is adminstered by mayor and council. Pop. (1930) 59,714, (1940) 63,083

MEDFORD, Oreg, city and Jackson County seat; alt. 1,377 feet, on the Southern Pacific Rathoad; 200m S of Engene, has an airport with airline service. Situated in the Rogue River Valley, it is the center of a fruit growing, dairy farming, lumbering, and mining region, and it is a summer resort. Near by is Rogue River National Forest, and the city is connected by lighway with Crater Lake National Park. From 1900 to 1910, as the fruit industry developed, Medford grew from a town of less than 2,000 to a city of more than 8,000. It has mayor and council, and city-owned water system Pop. (1940) 11,281.

MEDFORD, Wis, city and Taylor County seat, alt 1,114 feet, on the Black River and the Minneapolis, St Paul and Sault Ste. Marie Railroad, 79m. N.E. of Eau Clane Principal occupations are dairying, millworking hardwoods, and canning The city has a mayor and council, and owns its water supply. Pop. (1940) 2,361.

MEDHURST, med'herst, Walter Henry, English oriental scholar and missionary. b London, 1796, d there, 24 Jan 1857. He was educated for the ministry and in 1816 made a missionary tour through India and Malacca establishing limiself in 1822 in the island of Java, where he remained eight years. During this interval and for several years afterward he pursued his missionary labors also in Boineo and on the coasts of China. In 1843 he settled in Shanghai and subsequently passed six years in the interior of China. He was an intelligent student of the languages and literatures of eastern Asia, being well versed in the Chinese, Japanese, Javanese and other dialects, besides Dutch, French and English, in all of which he wrote. Besides a Chinese version of the Bible, he published 'Chinese Repository' (20 vols, 1838–51); 'Chinese and English Dictionary' (1842–43); 'English and Chinese Dictionary' (1842–43); 'English and Japanese Vocabulary' (1830); 'Dictionary of the Hokkien Dialect' (1832–39); 'Translation of a Comparative Vocabulary of the Languages of China, Corea and Japan' (1835); 'Notes on Chinese Grammar' (1842); 'Chinese Dialogues' (1844); 'China in its State and Prospects' (1838); 'Dissertation on the Theology of the Chinese (1847); etc.

MEDIA, mē'dĭ-a, Asia, an ancient kingdom and country of considerable extent, now comprised in the provinces of northwest Persia. It was originally inhabited by a Turanian race, who are called Medes by ancient writers, but this name properly belongs to an Aryan race, who had spread themselves widely in the high regions of Western Asia and ultimately established their ascendency in Media. They have been traced both by Persian and Indian traditions to the countries beyond the Indus The history of Media is involved in considerable obscurity, but careful modern investigations have made the main outlines fairly clear The Medes are first mentioned in connection with some of the kings of Assyria from the 9th

century B.C. Ramman-niiaii II of Assyiia, who reigned about 810 BC, led expeditions into Media and in 713 the great King Sargon conquered the country and made the Median princes tributary to the Assyrian monarchy.
According to the Assyrian inscriptions, one of the Median rulers named Dajaukku was carried off as a prisoner in 715 BC, this Dajaukku is the same as the Detoces who, according to Herodotus, founded the Median kingdom on an independent basis and fixed his capital at Echatana (now Hamadan) Deroces was followed by three kings in succession, bearing the names (in Greek) of Phraoites, Cyaxares and Astyages. Phraoites, to whom the Greek histotian assigns a reign of 22 years (647-625 BC), began the extension of the Median empire by the subjugation of the mountainous region of Persis, to the southeast of Media He then conquered other parts of Asia, and at length ventured to take the aggressive against the Assyrians and attack Nineveh. In this attempt he failed and lost his life Cyaxates succeeded him on the Median throne, and during a reign of 40 years raised his kingdom to the greatest power and importance it was destined to achieve. He thoroughly reorganized the army and advanced against Nineveli He gained several successes, but before he could take the Assyrian capital he had to return to defend his kingdom against the inroads of Scythians. At first the Scythians carried all before them and became viitually masters of Media, but Cyaxares temporarily secured his position by negotiating with them, and finally slew all their chiefs when they were overpowered by wine at a feast. Thus iid of Scythian authority, Cyaxares again advanced against the Assyrians. In conjunction with Nahopolassar, founder of the Neo-Babylonian empue, he captui ed Nineveh about the year 606 BC After this event the Assyrian dominions were partitioned between the two conquerors, the northern parts falling to Media and the southern portions to Nabopolassar. Nebuchaduezzar, son and successor of Nabopolassar, married a daughter of Cyaxares carried his arms into Asia Minor and waged war for five years against Alyattes, king of Lydia. On 28 May 585, the Median and Lydian forces were engaged in battle when a total eclipse of the sun took place and struck terror into the soldiers on both sides. This event disposed both sides to enter into peace negotiations, which were successfully carried through by the agency of Nebuchadnezzar and Syennesis, prince of Cilicia. Cyaxares probably died very shortly after this event, and left to his successor a greatly extended empire. Astyages was the last independent king of Media, and from 550 BC, when he was conquered by Cyrus the Persian, Media formed part of the Persian empire See Persia and consult Delattre, A. L., 'Le peuple et l'empire des mèdes jusqu'à la fin du rēgne de Cyaxare' (Brussels 1883); Opport, Jules, 'Le peuple et la langue des Mèdes' (Paris 1879); Prášek, 'Medien und das Haus des Kyaxares' (Berlin 1890); id, 'Geschichte der meder und Perser bis zur makedonischen Eroberung' (Gotha 1906); Ragozin, Z. A., 'Media, Babylon and Persia' (Now York 1888) 1906); Ragozin, Z. A., (M. Persia) (New York 1888).

MEDIA, Pa., borough, county-seat of Delaware County; on the Philadelphia, Baltimore and Washington Railroad, about 15 miles

west of Philadelpnia. It is a well-built, well-kept residential suburb of Philadelphia, and is situated in a fertile agricultural region. It is the headquarters for the Delaware County Institute of Science, established in 1833. The Institute has a library of about 5,500 volumes, and the borough library has about 3,500 volumes. The street-lighting plant and the waterworks are owned and operated by the borough The borough was incorporated in 1850; its government is vested in a burgess and council. Pop. (1930) 5,372, (1940) 5,351.

MEDIAL MORAINE. See MORAINE.

MEDIATION, in international law, is the friendly intercession of a third power or powers with a view to bringing about the settlement of a controversy between two or more states, to avert threatened hostilities between them or to bring to a close a war in which they are en-Most writers on international law make a distinction between "good offices" and "mediation." The employment of good offices by a third power consists in the tendering of friendly advice or the offering of suggestions to the disputing parties with a view to bringing about the settlement of a dispute or the conclusion of peace, if they are engaged in war. A government which tenders its good offices is understood to be willing to suggest a compromise as a common basis of agreement between the contending parties, to arrange preliminaries for the negotiation of a treaty of peace and to do anything else that may serve the parties in settling their controversy or in ending their hostilities

Mediation, on the other hand, has more of the character of friendly intervention. A mediator assumes the rôle not merely of adviser or conciliator but takes the part of a middleman,—usually the leading part,—in the conduct of the negotiations between the disputants. He is not, however, a judge, for mediation is not arbitration, nor is he an advocate for either side but, to use the language of Sir James Mackintosh, he is "a common friend, who counsels both parties with a weight proportioned to their belief in his integrity and their respect for his power." With a view to encouraging a more frequent recourse to mediation as a means of settling international controversies and in order to define the rôle of the mediator the Hague Peace Conferences of 1899 and 1907 adopted the following rules which were embodied in a convention which was ratified by practically all the powers of the world

"In case of serious disagreement or dispute, before an appeal to arms, the Contracting Powers agree to have recourse, as far as circumstances allow, to the good offices or mediation of one or more friendly Powers (Art. 2)

"Independently of this recourse, the Contracting Powers deem it expedient and desirable (the italicized words were added in 1907) that one or more Powers, strangers to the dispute, should, on their own initiative and as far as circumstances may allow, offer their good offices or mediation to the States at variance.

"Powers, strangers to the dispute, have the right to offer good offices or mediation, even

during the course of hostilities

"The exercise of this right can never be regarded by either of the parties at variance as an unfriendly act (Art. 3).

"The part of the mediator consists in reconciling the opposing claims and appeasing the feelings of resentment which may have alisen between the States at valuance (Art 4)

"The duties of the mediator are at an end when once it is declared, either by one of the contending parties, or by the mediator himself, that the means of reconciliation proposed by

him are not accepted (Ait 5).

"Good offices and mediation, undertaken at the request of the contending parties or on the initiative of Powers strangers to the dispute, have exclusively the character of advice, and

never have binding force (Art. 6)

"The acceptance of mediation cannot, in default of agreement to the contrary, have the effect of interrupting, delaying or hindering mobilization or other measures of preparation for war.

"If mediation takes place after the commencement of hostilities, the military operations in progress are not interrupted, in default of

agreement to the contrary (Att 7) »

It will be seen that the tender of good offices or mediation by third powers prior to or during hostilities is declared to be a legal right, though not an obligation The Convention, however, imposes on the disputants an obligation to have recourse to this mode of settling their controversies so far as circumstances allow. Each disputant is therefore the judge as to whether the circumstances in a particular case create an obligation to accept the offer tendered At the outbreak of the European War the President of the United States made known his willingness to serve as a mediator whenever he should receive assurances that an offer would be acceptable by the warring powers. Again in 1916 when war between the United States and Mexico seemed imminent the governments of several of the Latin American republics made known their willingness to offer their good offices in bringing about a settlement of the dispute but the American government declared that the circumstances were not such as to make recourse to this form of sentiment expedient. The express declaration of The Hague Convention that the exercise of the right of mediation by third powers shall never be regarded by either of the disputing parties as an unfriendly act was designed to remove all possibility that an offer of mediation might be construed as an act of gratuitous interference rather than the act of a disinterested friend of both parties. The rôle of the mediator is defined in article 4 as that of reconciliation and article 5 lays down the circumstances when his mission is terminated Article 6 which declared that mediation has no binding effect on the parties but is entirely advisory in character removes the possibility of further misunderstanding concerning its purpose and effect
The historical instances of recourse to good

The historical instances of recourse to good offices and mediation are numerous. A few of these may be mentioned as illustrations. During the war of 1812 between Great Britain and the United States, the Tsar of Russia offered to act as a mediator with a view to bringing about a termination of hostilities. The offer was accepted by the government of the United States and to avoid delays plenipotentiaries were at once appointed by the President to conclude a treaty of peace but the offer was re-

fused by the British government and nothing further came of the Russian proposal

Early in 1861 several Latin American republics tendered their good offices to avert the civil war then imminent; after the outbreak of hostilities the British and French governments through their ministers at Washington expressed a willingness "to undertake the kindly duty of mediation" if the President should de-sire it President Lincoln expressed appreciation for "this generous and friendly demonstration" but stated "that we cannot solicit or accept mediation from any, even the most friendly quarter " On various occasions during wars in South and Central America the President of the United States tendered his good offices to bring about the adjustment of difficulties or to terminate hostilities already existing One of the most remarkable of such examples of mediation on the part of the United States was that which was begun in 1866 and concluded in 1872 for the purpose of terminating the war between Spain on the one hand, and the allied republics of Peru, Chili, Bolivia and Ecuador on the other During the Franco-German War of 1870-71 France requested the United States "to join other powers" in an effort to bring about peace. President Grant replied that he anxiously desired to see the war ended and peace restored and that he would be glad to use his efforts in bringing about peace if Germany also desired the employment of his good offices At the same time the French government was informed that it was the uniform policy of the United States not to act jointly with European powers in interference in European questions During the Chino-Japanese War of 1894 the government of the United States made known to both belligerents its willingness "to contribute its kindly offices toward the restoration of peace" but when an inquiry was made asking whether the United States would be willing to join England, Germany, France and Russia in an intervention between China and Japan the President replied that the United States could not join the powers mentioned in such an intervention During the Boer War of 1899-1902 the government of the United States alone of all the governments approached by the South African republics tendered its good offices but the offer was not acceptable to the government of Great Britain

A remarkable recent example of the employment of good offices by the President of the United States to bring about the termination of war was the intervention of President Roosevelt in 1905 which resulted in the conclusion of peace between Japan and Russia. On 8 June 1905 the President caused identical notes to be sent to the governments of both belligerents expressing his wish that "the terrible and lamentable conflict now being waged" might be brought to an end and urging them "not only for their own sakes but in the interest of the whole civilized world to open direct negotiations with one another" He also expressed his entire willingness to do what he properly could if the two powers felt that his services would be of any aid in arranging the preliminaries as to the time and place of meeting of the plenipotentiaries which they might appoint The suggestion of the President was promptly acted upon and plenipotentiaries were appointed to negotiate a treaty of peace. They met at Portsmouth, New Hampshire, and a treaty of peace was signed on 23 Sept 1905

A still more recent example of successful mediation was that of 1914, which resulted in the temporary termination of an existing conflict between the United States and Mexico. On 25 April, the diplomatic representatives of Brazil, Argentina and Chile addressed a communication to the Secretary of State tendering the good offices of their governments for othe peaceful and friendly settlements of the controversy. The offer was promptly accepted both by the President of the United States and General Huerta, President of Mexico, and both parties agreed to a mutual suspension of hostilities at the request of the mediators.

At the suggestion of the mediators commissioners representing both parties were appointed and they met at Niagara Falls, Ontario, in May 1914 The mediating plempotentiaries in turn presided over the conferences. On 24 June a protocol embodying the terms of agreement was signed and it was duly ratified by both govern-See also Arbitration, International

Bibliography.—In addition to the general treatises on International Law (bibliography treatises on International Law (bibliography qv.) see especially Hershey, 'Essentials of International Public Law' (pp. 322–324; excellent bibliography on p. 3-12; New York 1912), Holls, 'The Peace Conference at The Hague' (pp. 176–203; New York 1900), Higgins, 'The Two Hague Peace Conferences' (pp. 167 ff; Cambridge 1909), Hull, 'The Two Hague Conferences' (pp. 267–276; Boston 1908), Moore, 'Digest of International Law' (Vol. VII, Secs. 1065–1068, Washington 1906) 1065–1068, Washington 1906)

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MEDICAGO, genus of leguminous plants common throughout the greater part of the globe and meluding such forage plants as alfalfa, medic and bur and mail clovers. Some species are annual, others perennial. In all there are about 50 species, of which about six are native to the United States. These include M sativa, M lupulina, M denticulata, M. Arabica In general the perennial species have violet flowers, the annuals small bright yellow flowers. The pods are single-seeded, curved and spineless in some, while in others it is spirally twisted, has spines on the edges and contains several seeds. Medicago sativa is the most important species, since it includes the valuable alfalfa and lucerne.

MEDICAL ASSOCIATION, American. See American Medical Association.

MEDICAL ASSOCIATIONS. Organizations of this general designation are very numerous and find their raison d'être in the desire of their members or founders to exchange information on professional subjects and to advance the status of the medical profession genassociations were organized as follows: Boston, 1735; New York, 1749; Philadelphia, 1765; New York, 1769; and others including New Jersey, 1766; Massachusetts, 1781; South Carolina, 1789; Delaware, 1700; Naw Hamashire, 1701; Corpse Delaware, 1789; New Hampshire, 1791; Connecticut, 1792. The leading association of this type, the American Medical Association (q.v.) was

founded in 1847 for the advancement of medical science and the improvement of the public health. Medical specialist associations include the American College of Physicians, founded in 1915, the American College of Radiology, founded in 1924, and the American College of Surgeons, founded in 1913, the American Ophthalmological Association, the Congress of Physical Therapy, the American Gynecological Association, the American Heart Association, the American Laryngological Association, the American Laryngological, Rhinological and Otological Society, the American Psychiatric Association, the American Proctological Society, the American Psychoanalytical Association, the American Psychopathological Association, the American Public Health Association, the American Radium Society, the American Rocentgen Ray Society, the American Society for Clinical Investigation, the American Society for Experimental Investigation, the American Society for Experimental Pathology, the American Society for the Control of Cancer, the American Society of Clinical Pathologists, the American Society of Tropical Medicine, the American Surgical Association, the American Therapeutic Society, the American Urological Association, the Association for Research in Nervous and Mental Diseases, the American Association for the Study of Allergy, the American Association for the Study of Internal Secretions, the Association of American Medical Colleges, the Association of American Physicians, the Association of American Teachers of the Diseases of Children, the Association of Military Surgeons of the United States, the American Association for the Study of Goiler, the American Society of Oral and Plastic Surgeons, the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, the American Association of Pathologists and Bacteriologists, the American Association of Industrial Physicians and Surgeons, the American Association of Railway Surgeons, and the American Association of Anatomists.

There are in addition several national associations which promote the interests of the medical profession in co-operation with the public. One of the best known of these is the Child Health Association. There are also state associations, county and municipal medical associations

MEDICAL CODE, a set of regulations adopted by a medical association outlining the conduct of members of the profession. The various codes prohibit advertising in public prints, as well as the endorsement of proprietary or secret remedies. The ethics of both «regular» and homocopathic schools define the relations of patient and physician and of attending and consulting physician, and provide that a physician shall attend the immediate family of a brother physician without charge, except when unusual labor, expense or exposure is involved medical code in this country was founded on the English code of medical ethics prepared by Thomas Percival in 1803 In 1847 the American Medical Association adopted a general code which superseded codes existing in several States, and which was unopposed till 1882. In the latter year a majority of the members of the New York County Medical Society voted to disobey the provisions of the code which forbade them to consult with any but «regular» physicians, claiming the right to consult with any physicians that the legislature of each State decided to be

legally qualified Similar action was taken by a majority of the members of the New York Academy of Medicine. This antagonism affected the whole profession in this country, and the immediate result was the formation of New York County and State associations, whose delegates were received by the American Medical Association, to the exclusion of those from the old societies. In 1903 steps were taken to heal their differences and unite the rivals into one body, with the code so modified in effect as to allow individual liberty in the matter of consultation Consult Flint, 'Medical Ethics and Etiquette' (New York 1883) and 'Principles of Medical Ethics' (Chicago 1912), the official work of the American Medical Association.

MEDICAL COLLEGES FOR WOMEN. See Education, Professional, Medical Educa-

TION IN THE UNITED STATES

MEDICAL CORPS, UNITED STATES ARMY. See MEDICAL ORGANIZATION IN THE UNITED STATES ARMY.

MEDICAL CORPS, UNITED STATES NAVY. See NAVAL MEDICAL CORPS, UNITED

STATES.

MEDICAL EDUCATION, Colleges and Schools, Legal Supervision, etc. Before the establishment of medical schools in this country medical students either went abroad to study or served an apprenticeship with some practising physician As a rule the appientice had little opportunity for study, but was forced to depend on what he could absorb by contact with his preceptor. The physicians of the 17th and 18th centuries who had studied abroad were usually classical students. The first public lectures on anatomy before a class of students in this country are said to have been delivered by Dr. William Hunter of Newport, R I., in 1752. It seems, however, that Dr. Giles Firmin as early as 1647 delivered readings on human osteology in New England, that Dr. Thomas Cadwallader of Philadelphia gave instruction to students in anatomy between 1745 and 1751; and that Drs. John Bard and Peter Middleton dissected the human body in New York City in 1750 for purposes of medical instruction In 1762 Dr. William Shippen of Philadelphia gave a course of lectures on anatomy, illustrated by actual dissections. These lectures were continued till the organization of the Medical College of Philadelphia (now the medical department of the University of Pennsylvania) in 1765. Dissections were rarely performed prior to 1760 and even autopsies were seldom permitted. At the time of the American Revolution, with a population of 3,000,000, there were probably about 3,500 physicians in the colonies, of whom it is estimated that not more than 400 had received medical degrees. In New England the clergyman was often the only available physician. Two medical schools were organized in the colonies, the Medical College of Philadelphia (now a department of the University of Pennsylvania) in 1765, and the medical department of King's (now Columbia) College, in 1768. The first medical degree conferred in this country, that of bachelor of medicine, was granted to 10 men by the Medi-cal College of Philadelphia in 1768. The degree of doctor of medicine was first conferred in 1770 by the medical school of King's College on two students who had taken the bachelor's degree in 1769. Fifty-one medical degrees had been conferred by these institutions before

1776, when operations were suspended by the war. In the colonial period two medical societies (the State Medical Society of New Jersey, in 1706, and the Delaware State Medical Society, in 1706) and one permanent general hospital were organized. Harvard University Medical School was organized in 1782, Dartmouth Medical College in 1797, the School of Medicine of the University of Maryland and the College of Physicians and Surgeons of New York in 1807. In 1813 the medical department of Columbia College was finally discontinued, the College of Physicians and Surgeons took its place in 1800. Of the 76 medical schools now existing in the United States (less than half the number of schools in operation in 1900), three were established between 1765 and 1800, 12 between 1801 and 1825, 19 between 1826 and 1850, 29 between 1851 and 1875, 80 between 1876 and 1900, 5 between 1901 and 1904.

At the time of the organization of the early medical schools the practice of obstetrics was relegated as a rule to ignorant midwives; physiology, histology, organic chemistry, pathology, and surgery, as now recognized, were hardly known. The schools at first conferred the degree of bachelor of medicine on those who had studied two years with a preceptor and attended one course of lectures, the degree of doctor of medicine after three years of study and two courses of lectures. The bachelor's degree was abandoned in 1813. At first the Medical College of Philadelphia required for admission some knowledge of Greek and Latin, physics, natural history and botany, but the requirement was abandoned about the time of the reorganization of the University of Pennsylvania in 1702. For a century there were as a rule practically no requirements in preliminary general education for admission to medical schools, and even to-day this is their greatest defect

and even to-day this is their greatest defect In 1839 the New York State Medical Society resolved that teaching and licensing ought to be separated as far as possible. Further discussion of this question led to a convention of delegates from all medical schools and societies in the United States, held in New York in 1846; from it sprang the American Medical Association. This national organization, thoroughly representative in character, gave a new impetus to medical societies The following societies have exercised an important influence in promoting higher standards: Association of American Medical Colleges (1890); American Institute of Homeopathy (1844); National Confederation of Eclectic Medical Colleges (1871); Southern Medical College Association (1892). These prescribe for admission to medical college and a configuration of medical colleges of the second configuration of the second configuration of the second colleges and configuration of the second colleges of the second colleges and colleges of the second colleges of the seco ical schools a preliminary general education equivalent to one year in a high school. All prescribe four courses of lectures in different years as a condition for an M.D. degree, though they give an allowance of one year to graduates of reputable literary colleges and of other professional schools All tend to improve facilities for teaching, dissections and clinics. The schools registered by these societies are 72, 19, 7 and 13 respectively.

In 1859 the Chicago Medical College, now the medical department of Northwestern University, was established to test the practicability of a thorough graded system of instruction. Students were divided into three classes, and each class was examined at the close of the

vear. Each of the three courses was six months in duration Attendance on hospital clinical instruction and practical work in the chemical. anatomic and microscopic, or histologic laboratories were required for graduation. In 1871 the Harvard Medical School adopted a similar plan The Syracuse Medical School followed. and to-day the graded system of consecutive lectures is the rule. In 1896 President Eliot wrote substantially as follows. Within 25 years the whole method of teaching medicine has been revolutionized throughout the United States The old medical teaching was largely exposition; it gave information at long range about things and processes which were not within reach or sight at the moment. The main means of instruction were lectures, surgical exhibitions in large rooms, appropriately called theatres. and clinical visits in large groups were repeated year after year with little change, and no graded course was laid down There was little opportunity for laboratory work. The new medical education aims at imparting manual and ocular skill, and cultivating the mental powers of close attention through prolonged investigations at close quarters with the facts and of just reasoning on the evidence. The subjects of instruction are arranged, as at the Haivard Medical School, in a carefully graded course, which carries the student forward in an orderly and logical way from year to year Laboratory work in anatomy, medical chemistry, physiology, histology, embryology, pathology and bacteriology demands a large part of the student's attention. In churcal teaching, also, the change is great. Formerly a large also, the change is great group of students accompanied a visiting physician on his rounds, and saw what they could under very disadvantageous conditions. Now instruction has become, in many clinical departments, absolutely individual, the instructor dealing with one student at a time, and personally showing him how to see, hear and touch for himself in all sorts of difficult observation and manipulation. Much instruction is given to small groups of students, thice or four at a time—no more than can actually see and touch for themselves

In 1918 there were, excluding graduate schools, 95 medical schools in the United States with 13,630 students. The growth in medical students in 32 years up to 1910 was 333 per cent. In the last 30 years, however, there has been a radical change in medical education in the United States which has had the effect, as will be shown in the following table, of improving the quality of the education, while at the same time reducing the number of those granted medical degrees. Acting upon the recommendation of the American Medical Association, a committee has made a division of medical schools into three classes, A, B and C, the first containing those medical schools which fulfilled the highest requirements. Here are the results following the reconstruction:

YEAR	Colleges	Students	Women	Graduates	Women
1904	160	28,142	1,129	5,747	
1914	102	16,502			
1915		14,891	592	3,536	134
1916	95	14,022		3,578 2,807	106
1918 1926	95 79	13,630 18,840	581 935		212
1930	76	21,597	955	4,565	204

While the actual number of physicians graduated is very much less than that of the year 1904 the reports of 1930 showed the largest encolment since 1911. The diminution in number of medical students was not affected by the European War nor was the actual number of medical students and teachers affected by the selective draft, for the Medical Officers' Reserve Corps and the Enlisted Medical Reserve Coips provided against that contingency

Class A colleges require a four-year high school course and two years of work in a college of arts and sciences approved by the council on education of the American Medical Association The council also specifies what is required in the studies both in high school and college, and also what is to be expected of the medical schools themselves, both in supervision, equipment, teachers, clinical facilities [including, for instance, daily dispensary cases, at least six maternity cases for each senior student and 30 necropsies for each senior class of 100 students or less], medical library, museum, dissect material, etc. In 1918 there were 69 medical colleges of Class A in the United States and two in Canada.

Medical schools of Class B are those which under the present organization give promise of being made acceptable by general improvements Of these there are 14 in the United States and six in Canada. Class C contains those which require complete reorganization, do not keep satisfactory records, or enforce entrance requirements or give a major portion of their instruction after 4 P M, or are privately owned and conducted for profit. Of these there are 12 in the United States.

The comparative value of the work done now and 25 years ago is realized when it is known that in 1904 only 25 per cent of medical schools required college work as an entance requirement, while in 1918 92 2 per cent did, and that in 1904 only 62 per cent of the medical students of the country were in the high grade medical schools, while in 1918 there were 95 3 per cent in the better schools, and that in 1904 but 64 per cent of the graduates in medicine came from the high grade colleges, while in 1918 the latter graduated 90 3 per cent.

In 1915 a national board of medical examiners was inaugurated with funds from the Carnegie Foundation. The board consists of six representatives from the government [two from the army, two from the navy and two from the public health service], three members of State licensing boards and seven other physicians appointed at large. The three medical schools which make a lower tuition charge for women than for men are the universities of Michigan, Pennsylvania and Vermont.

About 1903 a rapid improvement in medical education began in the United States, resulting in a very great decrease in the number of medical colleges and it was thought that a dearth of physicians would follow. Fears were also expressed that the medical education, the cost of which was thus greatly increased, would be the privilege of the rich, and that it would undemocratically exclude the poor boy, a fear which has not been justified Apprehensions were also felt that the raising of the standard of medical education would have the effect of decreasing the supply of physicians for

rural communities. This, however, has been obviated by the improvement of facilities in communication — automobiles, better roads, etc.

Out of 76 medical schools about 70 are coeduational, although a few of the medical colleges admitting women have no women students The State of New York has 9 medical colleges, the largest number in any State.

More attention should be paid in the United States to instruction in hygiene and state medi-In Great Britain no one can be appointed a medical officer unless he has a special diploma in public health. In this country little opportunity is afforded for general or special sanitary work on broad lines. This subject is now under discussion and doubtless progressive States will soon provide places where medical officers of health or other persons engaged in sanitary work can obtain practical and scientific training. The scientific investigations which would be made in the laboratories of such schools would be of great value to the public

The earliest law relating exclusively to physicians was passed by Virginia in 1639, but like the later act of 1736 it was designed mainly to regulate their fees. The act of 1736 made concessions to physicians who held university degrees. In only two of the 13 colonies were well-considered laws enacted to define the qualifications of physicians The general assembly of New York in 1760 decreed that no person should practise as physician or surgeon in the city of New York till examined in physic and surgery and admitted by one of his majesty's council, the judges of the supreme court, the king's attorney-general and the mayor of the city of New York Such candidates as were approved received certificates conferring the right to practise throughout the whole province, and a penalty of £5 was prescribed for all violations of this law A similar act was passed by the general assembly of New Jersey in 1772 In 1840 laws had been enacted by the legislatures of nearly all the States to protect cluzens from the impositions of quacks Between 1840 and 1850, however, most of these laws were either repealed or not enforced as a result of the cry that restrictions against unlicensed practitioners were designed only to create a monopoly.

State Supervision.— Careful attention needs to be given to the difference between a license and a degree, the one carrying with it the right to assume a title which is evidence of scholastic ability, the other the right to enter on the practice of a profession or a pursuit, both emanating from the same authority, the State, either directly or through intervening mediums foreigners are often puzzled to account for the diversity in our legislation, the fact is again emphasized that all matters of internal police control are left exclusively to the several States, and that national laws regulating professional practice cannot be enacted. Hence the laws of the United States will be silent concerning licenses and degrees except in so far as they may apply to the District of Columbia and cer-

tain recent political dependencies.

Licensing.—The requirements for admission to practise a profession in the 54 political divisions of the United States vary as greatly in the various professions as the political divisions differ in area, extent, population and importance. However, two general items appear

in full or in part in the various statutory requirements for licensing; namely, (1) the general preliminary education requirements, (2) the professional preparation. The general preliminary are given uniformly under the synopsis of requirements

Supervision. In medicine all political divisions except Alaska now have examining and licensing boards. In some States the stringent laws against non-medical practitioners are enforced, in others quackery receives such legal protection that any person may treat "the sick or suffering by mental or spiritual means without the use of any drug or material remedy. This is due largely to the fact that so many statutes lack specific definitions as to what constitutes the practice of medicine, and without these definitions the conviction of such practitioners cannot be secured through the courts. There is much misunderstanding in this country regarding the duty of the State in relation to the health of the people. It does not consist in discriminating between schools or systems of medicine, but in requiring without prejudice or partiality of all who seek a license to practise for gain on the lives of fellow beings a minimum pieliminary and professional training

Medical Sects.—As commonly understood, regular physicians have no distinctive theory or practice, homoeopaths treat diseases with drugs that excite in healthy persons symptoms similar to the morbid condition treated; eclectics make use of what they regard as specific remedies, chiefly botanic; physiomedicalists use only botanical remedies, discarding those which are poisonous In practice these distinctions are not always observed. The following political divisions specify homoeopaths, eclectics or osteopaths as constituting part of their examining boards or have other than regulars on them. Alizona, Arkansas, Califorma, Colorado, Georgia, Hawaii, Idaho, Illinois, Indian Territory, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Jersey, North Dakota, Ohio, Oklahoma, Oregon Penysylvana, Physical Scipt South Dakota gon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, Wisconsin, Wyoming.

Midwifery.—Special fees for certificates of registration as midwives are required in California, Illinois, Iowa and Texas. In the following political divisions the provisions of the medical practice acts do not apply to women engaged in the practice of midwifery: Ar-kansas, Colorado, Florida, Georgia, Idaho, Kentucky, Louisiana, Maryland, Mississippi, Montana, New Mexico, North Carolina, South Carolina, Tennessee, Washington. In other political divisions, though there are some special provisions for certain localities, the general acts regulating the practice of medicine make no reference whatever to the practice of midwifery by women. It would seem, therefore, that these laws restrict the practice of midwifery to licensed physicians. Practically the conditions in political divisions where the laws seem to restrict the practice of midwifery to licensed physicians are little better than in political divisions where the practice of midwifery by women without a license is authorized. There will probably be little change for the better till the practice of midwifery is regulated by definite statutory provisions.

EDUCATION IN MEDICAL THE UNITED STATES AND CANADA. Prior to 1765 students from America necessarily went abroad for their medical education, mainly to the medical schools of Edinburgh, London and Paris Others secured their training by serving an apprenticeship with a practicing physician. The latter custom was common in view of the expense incident to work abroad. As a rule, the apprentice had little opportunity for study, but was forced to depend on what he could absorb by contact with his preceptor The physicians of the 17th and 18th centuries who had studied abroad were usually classical students. Among the American Edinburgh graduates was John Morgan who had received his bachelor's degree from the College of Philadelphia in 1757. He had studied medicine under such men as William Hunter, Cullen and the Monros, and later visited Europe in search of additional training While in Edinburgh he conceived the notion of foundmg a medical school in l'hiladelphia, the same to be an integral part of the College of Philato be an integral part of the Conege of Philadelphia. In this project he enlisted the whole-hearted co-operation of William Shippen, Jr., a graduate of the College of New Jersey (Princeton). Shippen had studied in London and graduated from Edinburgh in 1702. This idea took concrete form in 1705 when Morgan, Shippen, and later, Rush gathered around them in the city of Philadelphia a group of students for instruction in the essentials of medicine, surgery and midwifery This was the first medical school in this country—The Medical College of Philadelphia—now a department of the University of Pennsylvania.

During the next half a century other schools followed, some of which were inspired by Louis and Laennec and showed clearly the influence

of French medicine.

The first medical degree conferred in this country, that of Bachelor of Medicine, was granted to 10 men by the Medical College of

Philadelphia in 1768.

At the time of the American Revolution, with a population of 3,000,000, there were probably about 3,500 physicians in the colonies, of whom it is estimated that not more than 400 had received medical degrees. Although the medical apprenticeship did not entirely disappear, the lecture became more and more widely accepted as the routine method of instruction, and partly in consequence of this tendency an extraordinary number of medical schools were established during the latter half of the 19th century. Some were short-lived, but others soon appeared to replace them. Unhappily, in these efforts to broaden and systematize the content of the medical curriculum, the importance of clinical experience was gradually lost from view, in a short time resulting in the anomaly of students attempting to learn medicine from books, having little or no contact with patients. Sir William Osler is credited with transplanting in this country the British custom of using medical students as clinical clerks in hospital wards, thus introducing a new appreciation of the importance of practical experience in clinical teaching which has influenced in greater or less degree all of our medical schools.

Near the end of the 19th century Germany was the Mecca for those who wished to devote themselves to the newly established and rapidly growing sciences of physiology, pathology and

bacteriology. Pupils of Ludwig, Cohnheim and Koch brought back with them not only new knowledge which had to be incorporated in the curriculum, but also a clearer understanding of the need for a satisfactory foundation of general education on which to build. The Association of American Medical Colleges, organized in 1890, recommended a minimum standard of high school graduation as a prerequisite for medicine. Johns Hopkins University in 1893 made a bachelor's degree a prerequisite for admission to the medical school. This action served to call attention to the necessity for at least some required standard of preliminary education.

quired standard of preliminary education.

State control of medical practice during the first half of the 19th century came to be exercised through local medical societies, membership in which was accepted as a sufficient qualification. Later, the diploma of a medical school was accorded the same recognition. The failure of the schools to keep abreast of scientific progress led to the establishment, during the last years of the 19th and the early part of the 20th centuries, of State medical boards with power to examine all candidates and to license those who were successful in meeting the standards of the board. Representing as they do a great improvement over the previous indiscriminating acceptance of school credentials, the State boards have, nevertheless, been handicapped by lack of funds and by political control.

The American Medical Association, organized in 1847, included in its constitution a declaration of purpose, in these words: «cultivating and advancing medical knowledge; elevating the standard of medical education; promoting the usefulness, honor, and interests of the medical profession; enlightening and directing public opinion in regard to the duties, responsibilities and requirements of medical men; for exciting and encouraging emulation and concert of action in the profession and facilitating and fostering friendly intercourse between those engaged in it » The most significant event in the life of the association was the reorganization in 1901 which brought all local and State societies into an organic union as constituent parts of the American Medical Association. There followed at once an inquiry into the standards and methods of medical schools. Data were collected from State boards showing the relative success or failure of the graduates of the various schools. The need for more comprehensive investigation of the problems of medical education led in 1904 to the establishment by the American Medical Association of a Council on Medical Education. ciation of a Council on Medical Education. Personal inspections, beginning in 1907, by representatives of the council called attention to the prevailing lack of standards, the meager resources and untrained personnel in many of the proprietary schools. The Carnegie Foundation for the Advancement of Teaching, by invitation of the Advancement of Teaching, by invitation of the Advancement of Teaching, by invitation of the Advancement of Teaching, by invitation of the Advancement of Teaching, by invitation of the Advancement of Teaching, by invitation of the Advancement of Teaching, by invitation of the Advancement of Teaching, by invitation of the Advancement of Teaching, by invitation of the Advancement of Teaching, by invitation of the Advancement of Teaching, by invitation of the Advancement of Teaching, by invitation of the Carnegie Foundation. tation of the American Medical Association and accompanied by the Secretary of the Council on Medical Education, visited all schools in the United States and Canada, and the results of their investigation, published in 1910, aroused the public to a recognition of the fact that medical education in this country lagged far behind that in Europe. By repeated visitation and by annual publication of a classified list of schools, the council was able to bring about a most remarkable improvement in the standards of medical education. Many of the weaker

schools closed; others gained strength through consolidation or university affiliation, nearly all were able to secure either private endowment or State support. By 1914 certain prin-ciples regarding medical education had be-come generally established although not by any means fully translated into appropriate action in every institution. These principles were, first, that a definite minimum standard of preliminary education must precede admission to the medical school; second, that in the medical sciences, such as anatomy and physiology, there must be experienced teachers, trained in their respective subjects, rather than practicing physicians who could devote only a few hours a week to the discharge of their academic responsibilities; third, that medicine must be learned neither from books alone nor from lectures only, but chiefly, from the observation of the sick; that hospitals and dispensaries, therefore, were just as necessary to a medical school as a chemical laboratory or a dissecting room, and fourth, to secure public confidence and support and to maintain high academic standards, it was regarded as necessary that medical schools should be integrated with the rest of the system of higher education; that they should become parts of, or at least affiliated with, universities, and that the proprietary interest of the faculty should cease

State boards were led to adopt rules or secure legislation excluding from the licensing examination graduates of low grade schools. This, in turn, caused the closing or merger of most of those schools which could not reach an acceptable standard, and the surviving schools were enabled to develop better educational programs.

In the development here outlined America borrowed from Europe many of the best features of the Scottish, French, English and German schools, at the same time integrating them with our own system of education and fitting them into our own university structure.

fitting them into our own university structure. In 1918 there were, excluding graduate schools, 95 medical schools in the United States with 13,630 students. In 1905 there were 160 schools and 26,147 students. The radical change in medical education which has taken place since 1910 has had the effect, as will be shown in the accompanying table, of improving the quality of the education, while at the same time reducing the number of those granted medical degrees. Medical schools were divided into three classes, A, B and C, the first containing those medical schools which fulfilled the highest requirements based on «Essentials» formulated by the Council on Medical Education and Hospitals of the American Medical Association and ratified by the association's House of Delegates. In 1929, medical schools had either attained an A rating or were deemed unworthy of any recognition and thereafter medical schools were listed as approved or unapproved.

The number of medical schools, students and graduates for five-year periods beginning with 1905 is as follows:

Year	Schools	Students	Graduates
1905	160	26,147	5,606
1910	131	21,526	4,440
1915		14,891	3,536
1920		13,798	3, 04 7
1925	80	18,200	3,974
1930	. 76	21,597	4,565
1935	. 77	22,888	5,101
1030	77	21.302	5.089

While the actual number of physicians grad-

uated was very much less than the number graduated in the year 1905, the reports for 1935 showed the largest enrolment since 1905. The classes entering during the World War period were the lowest on record.

were the lowest on record.

During the World War period there was little opportunity for advance in medical education, but in the decade and a half which followed, some schools were able to make remarkable progress toward the attainment of their objectives. Magnificent buildings, extensive equipment, generous support for research, good facilities, liberal budgets based on large endowments, placed not a few of our institutions in a position second to none. This development, apart from its purely financial aspect, has concerned itself largely with clinical teaching and the necessary clinical facilities.

There has also been a steady increase in the amount of preliminary education possessed by students entering upon the study of medicine. Although many schools have additional requirements, the following indicates the preliminary education acceptable to the council:

The minimum requirement for admission to approved medical schools is two years of college training which include English, theoretical and practical courses in physics, biology and general and organic chemistry. Three years or more in college is, however, recommended.

Since it cannot be assumed that all who have satisfied these requirements merely in terms of hourly credits are fitted for the study of medicine, it is desirable that qualitative standards for admission should be imposed.

As a rule candidates should have received their preliminary education in institutions approved by accrediting agencies acceptable to the council. Exceptions to this rule may be made in the case of applicants who have demonstrated superior ability. For the convenience of admitting officers, the council has prepared a list of colleges approved by national and regional educational associations.

Admission to approved medical schools may also be by examination under the following conditions:

(a) Candidates who have completed two years of collegiate instruction and present evidence of general scholarship of high order, but who lack ciedits in not more than two of the required subjects may be admitted on passing examinations in these subjects.

(b) Candidates who have completed three years of collegiate instruction and present evidence of having accomplished work of distinction in one or more fields of learning, but who lack credit in any or all of the required subjects, may be admitted on passing examinations in these subjects.

While the minimum requirement of the council for approved schools is two years, for the session 1939-40, 66 of the 77 medical schools in the United States, including 10 schools of the basic medical sciences, had a premedical prerequisite in excess of the minimum. Actually, only 223, or 3.8 per cent, of the freshman class of 1938-39 were admitted with less than three years. For this session, 21 schools had a requirement of two years. Similar figures computed on the basis of the freshman class of 1936-37 placed 12 per cent in this class, or 716 students.

The requirements for admission to practice a profession in the United States vary as greatly

in the various professions as the political divisions differ in area, extent, population and importance. However, two general items appear in full or in part in the various statutory requirements for licensing, namely, (1) the general preliminary education requirements, (2) the professional preparation. Recipiocity or endorsement policies exist between the States Further, in 1915 a National Board of Medical Examiners was organized, and at present its certificate is acceptable for medical licensure without exam-

mation in 42 States

The medical course in the United States in general covers four academic years of approximately 32 weeks each lifty-one schools offer such a course. The medical schools of Northwestern and Duke Universities and those of the Universities of Minnesota and Tennessee operate on the quarter system, permitting a student by utilizing the summer months to decrease the length of time necessary to obtain his degree. A considerable number of the students of these schools do not elect to study during the summer months. The medical schools of the University of Chicago are operated on a plan of individual promotion permitting a student to advance as rapidly as he desires, but the great majority complete the course in 12 quarters. Fifty-five schools require a four-year course, while 12 require four years of systematic instruction followed by a fifth year spent as an intern or in research work. Ten schools offer only a twoyear course. For the most part the latter are located in smaller communities where clinical material is so scarce that satisfactory teaching of clinical medicine would be utterly impossible. In many instances, facilities do not exist for the satisfactory teaching of such subjects as physical diagnosis and gross pathology, which involve the use of chinical material. The same is true of the introductory courses in medicine and surgery, which commonly form a part of the second year schedule. These schools since 1 July 1939 have been listed as recognized schools of the basic medical sciences.

The standard curriculum recognized by the Council on Medical Education and Hospitals consists of from 3,600 to 4,400 hours, distributed as from 900 to 1,100 hours a year, and grouped as set forth in the following schedule, each group to be allotted approximately the percentage of hours of the whole number of hours in

Por Cent

the courses as stated:

		rer cen	L
1.	Anatomy, including embryology		
	and histology		18 5
2.	Physiology 45		6
2. 3.	Biochemistry		4 5
4	Pathology, bacteriology and im-		
7	munology10		13
-	Distriction		- 5
j.	Pharmacology 4	• • • •	5 4
6 7.	Hygiene and sanitation3	• • • •	26.5
7.			20.5
	Neurology and psychiatry		
	Pediatrics		
	Dermatology and syphilology		
٥	General surgery		17.5
0.			21.0
	Orthopedic surgery		
	Urology		
	Ophthalmology		
	Otolaryngology		
	Roentgenology		
9.	Obstetrics and gynecology 4		5
۶.			100
	Totals		TOO
	Electives		0
	7371	h	:+ 0

When the teaching conditions demand it, a subject may be transferred from one division to another

In the published lists of the Council on Med-

ical Education and Hospitals, 67 medical schools in the United States and nine in Canada are listed, and 10 schools of the basic medical sciences in the United States and one in Canada, are also listed All but three of these schools at the present time enjoy the approval of the council, the three being on probation. In 85 schools, 6,364 freshmen students, 5,733 sophomores, 5,506 juniors, 5,447 seniors, 398 fifth year and 247 sixth year students were enrolled durated that the state of the state ing the session 1938-39 In the two medical schools of the University of Chicago, 520 students were enrolled, making a total of 24,215 in the 87 schools. There were, therefore, in the medical schools of the United States, 5,754 freshmen, 5,160 sophomores, 4,947 juniors, 4,921 seniors, plus the 520 students of the University of Chicago, making a total of 21,302. The enrolment in the schools of the basic medical sciences in the United States for the session 1938-39 numbered 569, of which 330 were freshmen and 239 sophomores. The enrolment in the 10 Canadian schools was, first year, 610; second year, 573, third year, 559, fourth year, 526, fifth year, 398, and sixth year, 247, a total of 2,913. In the one school of the basic medical sciences in Canada there were 47 students-24 freshmen and 23 sophomores

The 24,215 medical students enrolled exclude 1,152 fifth year students in the United States interning or engaged in research, and 121 in Canada interning as a requirement for the degree

of Doctor of Medicine.

There are 10 medical schools in Canada which offer a complete medical course and one which offers courses in the medical sciences covering two years only. All of these schools enjoy the approval of the Council on Medical Education and Hospitals. These schools vary in their preliminary requirement. For the session 1939-40 one required a degree for admission to a five-year course. Of the nine other schools, four have a six-year medical course preceded by senior matriculation which is equivalent to the work of the first year in a college of arts; one requires one year for entrance to a five-year medical course; three, including one school offering courses in the basic medical sciences, require two years and one has a three-year prerequisite.

It cannot be too strongly urged that those who wish to enter the medical profession should secure their training in an institution which is recognized by all State licensing boards. Otherwise they may find that their time and money have been wasted. There are schools in existence which do not measure up to accepted standards and therefore cannot be approved by licensing bodies. Students should most carefully consider the difficulties of future practice before entering

one of these institutions.

It is not possible to estimate accurately the cost of a medical education. Living costs vary in different parts of the country, and personal expenditures vary still more. There is also a difference in the charges made by medical schools for tuition. For the session 1938–39, three schools charged fees of less than \$100 a year. These were State universities which make an additional charge for nonresidents. State universities, generally speaking, do not accept students from outside the State. In 15 colleges fees were over \$500. Thirty schools made an additional charge for nonresidents ranging from \$37.50 to \$400. These amounts include annual

tuition fees and minor charges, such as for matriculation, breakage and graduation Though the fees in some instances seem large they do not by any means cover the cost of instruction No medical school at the present time can maintain extensive laboratories, pay the essential salaries to teachers and properly teach modern medicine without an income larger than that derived from students' fees Medical schools, along with other institutions of the higher learning, have been affected by the economic situation. Almost without exception income has been reduced, and in order to balance the budget, fees have been increased

It is extremely difficult for a student to earn money while at the same time he is carrying on his medical studies. The medical curriculum is so exacting that all available time should be spent in study. Many a student, in an effort to be self-supporting, has ruined his health or his scholarship Once a student has been dropped, it is extraordinarily difficult to obtain admission elsewhere The reason for this is that every school has many more applicants than it can receive, and in face of such active competition a student who has once tried and failed can scarcely hope to be given another chance to the exclusion of some other applicant whose record is unblemished. Therefore, unless a student has some very unusual ability which enables him to earn enough to support himself in a couple of hours a day, he should not expect to earn his way through medical school. It would be better for him to work until he accumulates the required reserves and then go to school. The physician has heavy responsibilities, and to discharge these obligations conscientiously he needs the best training that is obtainable. To warrant his sacrifice of time and money he must be sure to get during his college years an adequate foundation for his professional career

Provision is made in some schools for scholarships and loan funds for deserving students. In some instances the award is made solely on scholarship, but ordinarily the needs of the student are also given due consideration The scholarship may consist of the remission of the annual tuition fee or there may be a definite money payment to the recipient. In some in-stances scholarships are limited to residents of

the State.

Women are admitted to all medical schools of the United States and Canada except the following: Georgetown, Emory, Harvard, St. Louis, Dartmouth, Hahnemann, Jefferson, and Queen's

University in Canada.

In the United States the licensing of physicians is a function of the States Each State has its own board of medical examiners or department of registration. The medical practice acts of the various States differ, and information regarding the regulations for practice should be obtained directly from the officers within a State

In September 1933 the Council on Medical Education and Hospitals voted to undertake a resurvey of all medical schools in the United States and Canada. During the academic years 1934-35 and 1935-36, Dr. Herman G. Weiskotten, dean of Syracuse University College of Medicine, visited all schools in company with a representative of the council, the Association of American Medical Colleges or the Federation of State Medical Boards of the United States. A confidential report in graphic form by which the

schools were grouped in tenths of a rank order of excellence for each one of several criteria was sent to the schools visited. A committee of the council late in 1939 finished its final report which presents a comprehensive review of medical education in this country from 1934 to 1939. Schools of osteopathy and a few unapproved medical schools refused to permit an inspection of to lumish official reports. When the survey medical schools was undertaken in the fall of 1934, the number of medical students admitted to the first year classes in 70 schools in the United States was 0,537. The corresponding figure for 1939 was 5,768, a decrease of 769. On the other hand, the size of upper classes has not been reduced to the same extent. More careful selection of the students accepted will doubtless tend to diminish the number who drop out because of scholastic failure, so that the number of graduates may show a smaller decline than the number of matriculants. During the four years, 1935 to 1938 inclusive, the number of persons licensed annually to practice medicine increased from 5,500 to 6,252, showing that the reduction in the number of medical students had not dimmished the number of physicians added each year to the medical profession. The excess of physicians licensed annually over the number of medical graduates is attributable to the licensing of graduates of schools outside of the United States. At the time the schools were visited, the number of teachers with professorial rank in the basic medical science departments of the 66 four-year schools was 1,081, the number of students in the first two years was 11,434. The teacher-student ratio, therefore, for men in the higher ranks was 1.11. For 1939, the correspond-ing figure was 1,247 professors and 10,551 students, with a teacher-student ratio of 1 &

Since the completion of the survey, in a group of 28 of the less progressive schools, preclinical facilities have been improved in 17 at a cost of from \$29,000 to \$500,000 with an average of \$89,941. The total amount contributed for this purpose was in excess of \$1,500,000. Facilities for clinical teaching in 20 have been improved at costs ranging from \$10,000 to \$2,500,000 Total expenditure for this purpose has been in excess of \$10,500,000 with an average of \$545,795. Twenty-four of these 28 schools have increased their annual budgets by amounts varying from \$10,347 to \$87,816, with an average of morethan \$47,000 and an aggregate of over \$1,100,000. Such increasing expenditures during the depression years surely indicates a determination on the part of the public and the profession that there shall be no falling off in the standards of medical education or the quality of medical service. The policy of the council during this survey was different from what it was in 1905-10 for the reason that the whole picture of medical education is radically different from what it was at that time. Even the weakest of the medical schools at the time of this survey was a stable institution as compared with the numerous proprietary schools and diploma mills in existence at the time that the council was created.

In 1937 the medical schools of Canada were approached regarding the survey of Canadian medical schools made during 1934-36 as to the policy to be adopted in the future—that is, whether the American Medical Association should continue the grading of medical schools in Canada or whether they would prefer that the medical schools themselves or some other body take over this task. The problem was referred to the Canadian Medical Association which in June 1938 brought in a report to the effect that in the event of the Council on Medical Education and Hospitals of the American Medical Association publishing a list of approved schools, those Canadian schools wishing their inspection. This leaves each school free to deal directly with the council. In May 1939, the council voted that after 1 Jan 1945 the Canadian medical schools would be included in the council's classification only at their own request.

American medicine is assuming more and more a position of leadership and distinction in the world. A decline in the quality of medical education in many European countries has increased the responsibility of our medical schools to keep medical education abreast of the rapid advances in the knowledge applicable to medicine It is important to realize that the survey above discussed is part of a continuous process. The relationships of the Council on Medical Education and Hospitals to the medical schools and hospitals are on a day to day basis. The accrediting activities of the council, which were the first in professional education and which have been supported from the beginning by the medical profession, make it possible to keep not only the personnel of the medical schools and hospitals but also the general medical profession in touch with developments in medical education. The physician realizes, as no one else can, the disasters, personal or communal, that flow from ignorance and improper or incomplete preparation, and these can be prevented only by insistence upon high standards of medical education There are now sufficient medical schools for the instruction of physicians to meet the needs, so far as can be ascertained, of the public. It is true that a number of students every year fail to obtain admission to existing institutions, but these are for the most part border-line students and those least likely to render useful service in the practice of medicine. Widespread publicity and generally diffused knowledge of the council's activities have had a most salutary influence on the selection by men and women of medical schools qualified to prepare them for the ever increasing complexity of the actual requirements for the care of the sick and the prevention of disease. WILLIAM D CUTTER, M.D.,

Secretary, Council on Medical Education and Hospitals, American Medical Association
MEDICAL PIET D SERVICE See AM-

MEDICAL FIELD SERVICE. See Ambulance Companies; Hospitals, Military; Medical Organization in the United States Army.

MEDICAL JOURNALISM. One of the earliest newspapers on record, the Gazette de France, was issued by a physician, Renaudot (Paris 1631). He established the Gazette to bring employers and employees together. It was a quarto sheet, printed in four columns on one side Medical matters were not treated directly in the Gazette, but its purpose was the prevention of disease and suffering by lessening poverty. With the origin of scientific societies in Italy at the time of the Renaissance, these published journals which sometimes contained articles of medical interest. The first journal paying considerable attention to medicine was Le Journal des Scavans. This was published

every Monday for three months at Paris, at the beginning of 1665, the next year it continued longer, and then every two weeks rather regularly. It lasted some 10 years, and altogether some 700 pages were printed Early issues, contained reviews of Willis' (Cerebri Anatome,' and Steno's 'De Musculis et Glandulis,' and other medical reviews of current interest. The German Society of Naturalist Physicians (Gesellschaft Naturforschender Aerzte), founded in 1652, began to publish in 1670, after coming under Imperial protection, its 'Transactions' monthly under the name Ephemeridæ. A more purely medical periodical was the Acta Medica Hafiensia, edited by Thomas Bartholin at Copenhagen in 1671. The Royal Society chartered by Charles II began to publish its well-known philosophical 'Transactions' in 1665. Included among its publications were the works of Malpighi and Leeuwenhoek in the 17th century and those of Galvani in the 18th

All these were in Latin The first medical periodical in the vernacular was the Nouvelles Découvertes sur toutes les Parties de la Médecine, issued monthly (Paris 1679-81). It was published by Nicholas de Blagny, a somewhat irregular medical practitioner of the time who realized the value of publicity. He met with decided opposition from the medical profession, who deprecated not only his methods but above all the publication of medical matters in the language of the people He waked the French medical profession, however, to the value of a medical publication and not long after, a Journal de Médecine was published by the Abbé de la Roque and continued by Claude Brunet, who established a monthly, Progrès de la Médecine (1695-1709) French medical journalism then went to sleep, to use the expressive phrase of Sudhoff, for some 50 years. Formal German medical journalism began with the Acta Medicorum Berolinensium, founded in 1717. This appeared twice a year at first, and then annually until 1730 In 1717, there began at Leipzig a quarterly publication called the Collection of Natural History and Medical Information This continued for many years. The second half of the 18th continues the publication of the 18th continues and the continues and the continues of the 18th continues and the continues are the continues and the continues are the continues and the continues are the continues and the continues are the continues and the continues are the continues and the continues are the continues and the continues are the the 18th century saw a thorough waking up to the advantage of medical journalism. At Hamburg in 1759 the weekly, Der Artz, began. In various German cities, a series of medical Bibliotheks, that is, regularly issued reviews of medical books, made their appearance In 1767, the German medical journal, Neue Arzneien (New Remedies) was founded. Most of these journals lasted only a few years until their founder became occupied with other things or his enthusiasm evaporated

Eighteenth century medical journalism or its equivalent, at the time, consisted to a great extent of the transactions of various medical societies. A number of very important contributions to medicine were published originally in these and they have a distinct bibliographic value. Sudhoff suggests that the material for the cultural history of medicine in this century lies buried in the files of its forgotten medical periodicals. These were very numerous and Garrison has given a check list in chronological order of some hundred of them

Toward the end of the 18th century, the special journals of the scientific departments of medicine began to make their appearance. Probably the most important of these was

Reil's Archw fur die Physiologie (1795), which was the incentive for the foundation of Johannes Muller's Archiv fur Anatomie, Physiologie und wissenschaftliche médicin (Berlin and Leipzig, 1834-57), continued by Reichert and Du Bois Reymond and still published at the present time Siebold's Lucina (Leipzig 1802-11), Langenbeck's Bibliothek fur die Chrurgie (Gottingen 1805-13), Giafe's and Walther's Journal der Chrurgie und Augen-Heilkunde (Berlin 1820-50), Magendie's Journal de physiologie expérimentale (Paiis 1821-31), Malgaigne's Journal de Chrurgie (Paris 1843-46), Bulletin de la Société anatomique de Paris (founded in 1826 and still current), and the Mémoires and Bulletin de l'Académie de medecine are typical examples

About the middle of the 19th century, year-books began to be regularly published. About the same time Virchow's Archiv fur Pathologische Anatomie and the Comptes rendus of the Société de Biologie of Paris began publication. There are now literally hundreds of such journals published in the various countries and languages. The tendency to extreme specialization in medical journalism became marked in the last quarter of the century when special journals for narrow interests were published Mind (1876), Brain (1879), and La Cellule (1884), are typical examples. Garrison notes that the contribution of the 20th century to medical journalism is the large number of recent periodicals devoted to the psychological and sociological aspects of the sexual instinct.

In Italy medical journalism developed rather slowly, Italian professors being inclined rather to write books than the shorter articles Certain special subjects like electrotherapeutics, because of Galvani's and Volta's discoveries, were covered early Il Galvani, with the subtitle Giornale di Elettro-Idro-ed Aero-Terapia, was published at Milan at the beginning of the 19th century All medical therapeutics was reduced to electrical terms by it Since then the Italians have the habit of calling their medical journals after their great physicians, and have had journals named for Cesalpino, Malpighi, Spallanzani and a number of other distinguished medical discoverers.

A very early attempt at the publication of a medical journal in America was made through a translation of the French Journal of the Multary Hospitals, under the title of A Journal of the Practice of Medicine, Surgery and Pharmacy in the Military Hospitals of France (Vol I, No. 1, New York 1790). This contained some 120 pages but is the only number that has

come down to us.

The first medical journal published in America was the Medical Repository, a quarterly, under the editorship of Samuel L. Mitchill, Edward Miller and Elihu Smith It was founded in 1797, and the interest which it aroused can be best appreciated from the fact that of volumes I and II, a second edition was printed in 1800 and exhausted, and a third edition issued in 1804. This is the only time in the history of American medical journalism that this has happened. The Medical Repository continued publication until 1824. Its success led after a few years to the almost simultaneous foundation at Philadelphia of two medical journals, The Medical Museum (1804-11) and the Philadelphia Medical and Physical Journal

Though neither of these lasted (1804-07) long, the establishment of other medical journals went or apace. In Boston, the Medical and Agricultural Register was published for two years (1806-07), the Baltimore Medical and Physical Recorder for a similar period (1808-09). An effort was made to attract additional readers in these journals by including subjects of cognate interest. This was also the case with regard to the American Modical and Philosophical Register (New York), which lasted, however, only some five years (1810-14). The New England Journal of Medicine and Surgery had a happier fate, enduring some 15 years (Boston 1812-28) Philadelphia had by this time, owing to professional jealousies and politics and the mismanagement of medical schools in New York, come to be the centre of medical education in the United States and the medical journalism of the country focussed there. The American Medical Recorder (1813) lasted more than 10 years and was tollowed by the Philadelphia Journal of the Medical and Physical Sciences, founded in 1820 by Nathaniel Chapman In 1825, the title of this journal became the American Journal of the Medical Sciences, still with us. Under the editorship of Di Isaac Hays and his son, this came to be the representative American medical journal long known as Ilays' Journal The oldest American medical weekly in existence is the Boston Medical and Surgical Journal, founded in 1828, whose editors have been some of the most distinguished physicians of Boston The Medical News, founded in Philadelphia by the younger Dr. Hays in 1843, was transferred to New York (1896) and combined with the New York Medical Journal (1905). This latter was founded in 1865, followed almost immediately by the Medical Record (1866), both still in existence.

The first medical journal issued west of the Alleghanies was the quarterly Reporter of Medicine, Surgery and Natural Sciences, issued at Cincinnati, 1822. The first Canadian medical periodical was the Journal de Médecine de

Quebec, issued in 1826

The founder of medical journalism in its modern sense, as not only a carrier of news and information for physicians but also as a force for the uplift of the profession, the regulation of the practice of medicine, the direction of medical legislation, and the exposure of abuses, was Thomas Wakley, an Englishman, who in 1823 founded The Lancet in London. When this appeared there were a great many abuses, especially in hospital practice and medical education needing correction. Hospital posts and even sometimes medical professorships had become family matters, subjects of inheritance. Hospital instruction was so given that it reached but a very limited number. Wakley began by publishing the hospital lectures of professors for the benefit of the profession. When Abernethy, the distinguished London surgeon of the time, applied for an injunction against the publication of his lectures without his permission, Lord Eldon decided that lectures delivered in hospitals were public property. The trial proved a good advertisement for Wakley and his work, and after a time he was elected to Parliament and he became the most important factor in England for the correction of social abuses by legislation. The

Lancet has always continued the work of its founder in this regard, and has been noted for its crusades against food and drug adulterations, its campaigns for the correction of medical abuses, and its leadership of the medical profession of England generally for the amelioration of medical social conditions. The work of The Lancet was not only supplemented but extended in England, when the British Medical Journal, representing the British Medical Association, was founded in 1857 association, organized in 1832, pu association, organized in 1832, published yearly 'Transactions' until 1853, and then the Association Medical Journal, which was sucsome five years The British Medical Journal after some five years The British Medical Journal has come to be a most powerful factor for the correction of medical abuses and the exposition of impositions of various kinds upon the pro-Medical Association, founded in 1847, did not establish its journal until 1883. This was scarcely more than a weekly 'Transactions' until under the management of Dr. George Simmons, at the beginning of the present century, it began to be thoroughly representative of the best interests of the medical profession in America and of the genuine medical interests of the public, taking its place worthily beside the British Medical Journal The Journal A M A, initiated the reform of medical education by securing four-year courses and fulltime professorships in the medical schools, and thus has secured a noteworthy reduction in the number of schools of medicine in the country, decidedly to the advantage of medical teaching generally. It was enabled to do this through its reorganization of the American Medical Association which strengthened State and county medical organizations and brought a reform of their medical journals. The advertising abuses of medical journals were emphatically pointed out and an initiation of reform secured. The Journal A. M. A. has done extremely valuable work for the medical profession and the public in the exposure of quacks, the regulation of physicians' registration and, above all, the analysis and exposure of so-called patent medicines, many of which selling in very large quantities, at expensive prices and bought particularly by the poor, were shown to contain either such harmful materials as alcohol or cocaine as their chief ingredient, or else to be made up of absolutely inert materials like salt

or sugar and water, slightly colored.

The success of the London Lancet led to the foundation of the Lancette Française in 1828, which followed the plan of reporting hospital lectures and afterward became the Gazette des Hopitaux, which still continues. The Gazette Médicale de Paris was founded in 1830. Other French journals in large numbers were founded in the second half of the 19th century and the weekly newspapers were supplemented by the Progrès Médicale, paying attention particularly to current medical items, Paris, 1873. In the last quarter of the 19th century a whole series of such weekly journals meant to carry medical news and represent the medical profession as well as organize the correction of abuses, were founded in various parts of the world. The Deutsche Medizin, Wochenschrift in 1875, Vrach in Saint Petersburg in 1880, and Geneva. Munich Prague Rome. Vienna and

many other cities came to be represented in this way

At the beginning of the European War, there were some 1,700 medical journals published in the various languages. Their distribution was as tollows the United States had 630, Germany, that is, the German-speaking countries, 451, the French, 268, the British, 152, the Italian, 75, the Spanish, 29. This was entirely too many for the maintenance of such proper standards as would make them seriously valuable and prevent abuses. Many of them were published almost entirely as a means of propagating information for business purposes with regard to various drugs and preparations, the journals being established for this purpose, or the proprietors allowing their columns to be used for such exploitation because of the money paid for advertising. The more medical journals the lower the standards. The war, with its scarcity of paper, etc, brought an end to a great many of the proprietory medical journals and undoubtedly it has done very much to purify the field of medical journalism.

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JAMES J. WALSH, M.D.

MEDICAL JURISPRUDENCE, the science of applying medical knowledge to the purposes of legal investigation, the application of the principles and practice of various branches of medicine in judicial proceedings requiring the explanation of doubtful questions, such as those relating to conception and birth, time and cause of death, physical and mental diseases, etc. Medical jurisprudence is often spoken of as forensic medicine, that is, the medicine of the forum It embraces subjects both purely medical and purely legal, and covers a very wide range These questions have usually been considered under five divisions (1) Such as arise out of the relation of sex, including impotency, pregnancy, legitimacy and rape; (2) injuries to persons, as wounds, death from violence, poisoning and abortion, (3) disqualification by different forms of mental diseases; (4) feigned disability or disease; (5) questions as to age, identity and life insurance. The major part of what is known as medical jurisprudence relates to evidence given in courts, even if the whole subject is not properly embraced within the subject of judicial evidence. As medical books can be used only in a very restricted sense in judicial proceedings, the testimony of medical experts has become very important Our laws do not give recognized preference to any particular class or school of medical practitioners as qualified for expert witnesses. Knowledge is the test of qualification to give such evidence The presiding judge passes, as a preliminary, upon the question of qualification and determines whether the witness shall be permitted to testify. The opinion of a medical expert is never conclusive but is simply to be regarded by the judge or jury in the same manner as other evidence given to assist in establishing a fact. The medical expert is frequently called upon to state facts, as well as to give his opinion based upon facts shown by other testimony to exist. He may testify as to the health of a patient whom he had treated, of his habits and mental traits. He may testify that he found poison in the stomach of a person found dead and give an opinion as to whether the poison caused death. He may give an opinion as to how long a person has been dead, from the condition of the body when found, whether a certain wound would produce death; and his opinion as to the instrument used to inflict the wound.

In all of these subjects of investigation the evidence of a medical expert is almost indis-pensable. In matters of life insurance, where the insured dies shortly after a policy has been issued to him, medical expert examination and evidence are often of great importance, bearing upon the condition of the insured at the time of insurance and upon the question of representations In suits for injuries to persons through the fault of others the question of the extent and probable continuance of disability are to be investigated with the aid of expert evidence. Many questions of supposed crime could not be properly determined without the knowledge and skill of the physician, applied as science directs. In cases involving sanity and mental capacity medical jurisprudence reaches the zenith of its importance. The untrained non-scientific mind cannot measure the status and capacity of other minds If it is difficult, sometimes nearly impossible, for the best informed to determine accurately the physical condition of a person, none but those eminent for knowledge of and experience in matters of the mind ought to judge of its condition and hazard opinions as to its peculiarities and capacity. Insanity is a disease of the mind which assumes many forms -almost as many as there are different phases in the human mind. Many definitions are given of insanity, one of which is that it is a physical disease located in the brain, which deranges the mental and moral faculties to a greater or less degree This definition is not quoted in preference to any other for the purpose of approval, but because it differs so iadically from others, and to show the difficulty of comprehending the nature of this dread malady. The general term insanity comprehends all shades of mental diseases, from the slightest abnormal condition to that of the wildest ma-The expert alienst is called upon to testify as to a person's ability to make a will, a contract or to transact any kind of business. He is asked to decide whether a person is bereft of his normal reason to the extent that prudence requires his confinement; and when he has been confined, whether it would be safe or prudent to let him have his liberty The questions upon which the expert's opinion with regard to the insane, or those supposed to be insane, are asked, can hardly be cnumerated. The importance of the subject cannot be overestimated, and new and earnest efforts are being constantly exerted by the medical pro-fession to render its information upon this difficult subject as full and complete as possible. Many works upon medical jurisprudence have been published and in all of them insanity, in its various forms, has had a prominent place, while quite a number of authors have produced commendable works devoted entirely to the subject of the medical jurisprudence of insanity. Consult Scheffel, Carl, Medical Jurisprudence (Philadelphia 1931), and Smith, S. A., Forensic Medicine (8th ed., London 1943).

MEDICAL ORGANIZATION, United States Army. The separation of the War Department into a Department of the Air Force by the National Security Act of 1947 required certain changes in medical organization which were not immediately worked out. While the historical part of the present article will deal with the medical organization of the War Department, the statement of present medical organization and functions will deal, except in a few instances, with those of the

Department of the Army.

History.—The history of the United States Army Medical Department began in the Colony of Massachusetts Bay on May 8, 1775, when the Provincial Congress ordered that a committee of physicians, appointed by the Congress, examine as to professional qualifications all persons recommended for appointment as surgeons to the several regiments by their commanding officers. Prior to this date, medical and had been voluntarily rendered by private physicians, who later sent in bills for services rendered. These physicians had no military status or authority. At this time the inchoate medical establishment of the army was termed "The Hospital" On July 19, 1775, the Colonial Congress in Philadelphia appointed a committee to consider ways and means of establishing the hospital, a project strongly recommended by Gen George Washington The Colonial Congress, on July 27, 1775, created "An Hospital," with Dr. Benjamin Church (q.v.) as director general and chief physician, at four dollars per diem. Three months later Church was tried by a council of war for treasonable correspondence with the enemy, and imprisoned. Dr. John Morgan (qv.) was appointed to succeed him. Morgan, who had been instrumental in organizing the medical department of the University of Pennsylvania (1765), rendered most valuable services up to his dismissal from the army, Jan. 9, 1777. On April 11, Dr. William Shippen (q v) was appointed to succeed Morgan, who later (1779) received a handsome exoneration at the hands of Congress. Morgan's dismissal was due, in part, to the mcreasing sickness among the troops and to the difficulty in supplying them with medical supplies, but principally to the fact that the medical service was very loosely organized. As there was no strong central government and no War Department, it necessarily followed that there could not be an organized medical service under central direction. At this time the Prussian and British plan of medical administration was in vogue, with physicians, surgeons, and deputy directors general, and a fourth staff officer dubbed "Physician and Surgeon General of the Army" in each of the Middle, Eastern, and Northern departments. These four "generals" were of vague status and their office was apparently established at the same time as that of the director of "The Hospital." All this led to further contretemps, such as the court-martial and acquittal of Shippen (1780). The congressional resolution of Sept. 30, 1780 resulted in the election of Shippen as director general and the appointment of John Cochran as chief physician and surgeon. By the end of the war, con-

gressional acts assigned a director and deputy director of the Hospital Department. General Washington manifested the keenest interest in the welfare of the medical establishment, as evidenced particularly in his instructions to Moigan for the removal of the hospital to New York (April 3, 1776), his letters to John Hancock on the doubtful and jealous character of the regimental surgeons and their intrigues against the hospital (1776–1777), and his letter of approval of Shippen's and Cochran's plan for reorganization (Feb. 14, 1777) The first hospital regulawashington and the regimental surgeons, were published in July 1776. The first army regulations, drafted by Friedrich Wilhelm von Steuben (qv.) in the winter of 1778 1779, contained a section on "treatment of the sick"

While the results achieved by the medical service during the Revolutionary War seem open to criticism, it must be remembered that the high mortality among the troops entolled, not dis-similar to that of other armies of that time, was due chiefly to respiratory and gastromtestinal diseases in epidemic forms, and to septic conditions following battle wounds. As might be expected, regimental hospitals were collections of sick men huddled together without organization, regulation, sufficient clothing, or rudimentary comforts. Many fatal infections at that time were caused by the common practice of variolating with human unattenuated smallpox virus through purchase of scabs in the open market. This practice, although forbidden by Gen. Horatio Gates, continued until swept away by Jennerian vaccination in 1796-1798 The earliest examples of the Medical Department's contribution to medicine are found, however, during this period, in the publication of the first American pharmacopeia in 1778 and the publication of a treatise on wounds and fractures in 1776 by Dr. John Jones (q.v.). The latter was not only the first American book on surgery but also, by reason of the appendix on camp and military hospitals, the first American book on military medicine.

During the Revolutionary War, 1,400 medical
men of the colonies volunteered their services. Many of them achieved eminence, not only in the field of medicine but also in actual command of

troops, and in the legislative halls of Congress. Following Yorktown (Oct 19, 1781), Congress rapidly demobilized the army in 1782–1783 and the Hospital Department was all but disbanded. In 1792 the army was reorganized as a "legion" (5,120 men), with Richard Allison as surgeon of the legion (1702–1706). In 1708, war being mminent with France, Congress authorized an army of 10,000, with James Craik (qv.) as physician general (1708–1800). In 1800, when war did not eventuate, these forces were disbanded The strength of the army at the out-break of the War of 1812 was 6,742. The Medical Department was reorganized, but without a strong, centralized head. It encountered the same difficulties as were encountered in the revo-Mortality, morbidity, and noneffectiveness due to communicable diseases constituted a far greater drain upon manpower than battle casualties. Military authorities now agree that the ravages of smallpox and other communicable diseases were the chief causes of the failure of

various campaigns in the war.
In 1813, James Tilton was appointed physician and surgeon general In 1814 regulations of the

Medical Department were issued, defining for the first time the duties of a medical officer. Tilton initiated a fundamental policy when he abolished the distinction between a physician and a sur-Medical officers of the army since that time have been known as surgeons, but the duties required of them are in nowise limited to surgery as a specialty in the field of medical practice

After the War of 1812, the army was again disbanded, the physician and surgeon general was discharged, (1815), and there was no Medical Department until 1818 when Joseph Lovell was appointed surgeon general From the time of his appointment to the present, the history of the department is unbroken, it has always had a surgeon general, always remained a corps organiza-

Lovell effected a central organization, required allegiance on the part of post, departmental, and territorial surgeons, revised the regulations for the administration of the Medical Department, and made the first annual report of the department to the secretary of war. He also initiated at all military stations a system of observations and reports of weather by the medical officers stationed there. This constituted the only weather service of the country for many years During his incumbency (1818-1836) the practice of requiring professional examinations of candidates for the Medical Corps, continued since 1775, was regularized by an act of Congress, and medical officers were given the pay and relative rank of other officers of the army Serving under Lovell, Assistant Surgeon William Beaumont (qv), in 1833, published his work on digestion which won him recognition as the nioneci physiologist of the United States In 1836, Surgeon General Lovell established the iibrary of the Surgeon General's Office

Although the Medical Department made few notable scientific contributions to medicine from Beaumont's day to the Civil War, important administrative developments occurred during that period Among the most important were the granting of definite rank to medical officers in February 1847; an increase in the Medical Department in 1848 to service the many new garisons in the new territory acquired during the Mexican War; the bestowal upon medical officers of the right of command in their own department, with special reference to patients in hospitals; the appointment of hospital stewards in 1856; the publication of *Medical Statistics*, U S Army, the first part in 1857, the second in 1859; the detail of the first delegate of the Medical Department to the American Medical Association in 1851, and the adoption of the use of ambulances in 1859. Otherwise, the Medical Department went along doing its duty in garrison and field, in peace and war It fought scurvy, malarıa, typhoid, dysentery, diarrhea, as well as

Indians, Mexicans, and official neglect.

The Civil War found the government and the Medical Department unprepared. There was no organized ambulance or field hospital service, and no organization for evacuation to the rear, where hospital service was hastily improvised in hotels, barns, and neighboring private houses. The introduction of rifled arms, with fixed ammunition and conoidal bullets, had vastly increased the range and rapidity of fire, with much wider danger zones and greater dispersion of the wounded over the field As the engagements increased in magnitude, the wounded lay helpless on the battlefield for hours extending to days before the slow work of evacuation was com-This not only caused immense suffering and losses among the wounded, but also interfered seriously with the mobility of fighting units through delays and stalling of vehicles, some-times demoralized commands as to fighting capacity, and encouraged skulkers to desert the lines under the pretext of assisting the wounded to the rear All this was changed by the advent of Jonathan Letterman (1824-1872), who became the medical director of the Aimy of the Potomac on June 19, 1862, and whose genius for medical administration brought about the epochmaking reforms which became a pattern for all armies, and eventually fixed principles in our own Letterman organized a system for the evacuation of wounded, which was placed in operation under the chaotic conditions following the seven days of fighting near Harrison's Landing At Antietam, this system was applied with great success. By this orderly system of field service, with aid stations in close support of battalions and regiments, and an ambulance service and field hospitals in the rear of divisions, 12,000 Union and 2,000 Confederate casualties were transferred to the field hospitals in 24 hours. The Letterman plan constitutes the basis of the plan of evacuation in the United States Army today.

Another extraordinary medical officer whom the Civil War brought forward was Surgeon General William A Hammond (qv.) He was the first to hold the rank of brigadier general with its pay and emoluments Surgeon General Hammond, despite his unfortunate conflict and prolonged controversy with Secretary of War Edwin M Stanton, was the strong man of the Medical Department in those days of stress. Under his administration the general hospitals were placed under the control of the surgeon general and, in May 1862, the Army Medical Museum was established. Hammond also recommended the foundation of the Army Medical School in 1862, an ideal consummated by George M Sternberg (qv) in 1893; recommended a permanent hospital and ambulance corps for the Medical Department, and independent transportation for the medical service; and succeeded in placing volunteer medical officers under the direction of the surgeon general Hammond's administration was singularly effective, although marred by his dismissal by general court-martial Aug 30, 1864. The findings and sentence were annulled, however, and Hammond was made a brigadier general on the retired list in 1878 Following the Civil War, there was, as in all

Following the Civil War, there was, as in all previous American military history, a general demobilization, followed by a reorganization of the Regular Army From this time until the outbreak of the Spanish-American War, very little was accomplished in the field of army medical

service

The outstanding events during the period were the establishment, by act of Congress, of the Hospital Corps, composed of men enlisted by the Medical Department for medical service exclusively, and the establishment of the Army Medical School in 1893 for the training of regular medical officers in military medicine and surgery, with particular reference to preventive medicine. George M Sternberg, who was surgeon general from 1893 to 1902, was the American pioneer

in bacteriology and a lifelong worker in public health. He discovered the pneumococcus bacterium independently of, and almost simultaneously with, Louis Pasteur Steinbergs' Manual of Bacteriology, issued in 1803, was a landmark of the science in America. Throughout most of his career, General Sternberg was a student of, and a writer on, vellow lever. It was he who appointed the commission, of which Walter Reed was head, to study yellow fever in Cuba after the Spanish-American War.

In spite of Steinberg's scientific attainments, the Medical Department, like the rest of the country, was totally imprepared for the Spanish-American War. Our military forces, distributed in small commands throughout the United States, had had no military training in large units. The medical service was organized on the post basis, without plans or preparations for expansion of personnel and procurement of supplies. The strength of the army was barely 25,000 and the

Medical Corps numbered 192 officers

During this war Congress made no provision for an increase in the regular Medical Corps. except for 15 assistant surgeons. The war was fought largely by volunteers. The act of April 22. 1898 authorized 8 corps surgeons, 110 division and brigade surgeons, all volunteers, and 650 contract surgeons. The strength of the Hospital Corps was 6,000. Approximately 2,500 medical officers and 22,500 hospital corpsmen were needed. Consequently, the medical service was totally madequate and the results appalling This breakdown in medical administration was due in part to the meager equipment and persound allotted the army on a peace footing and, m part, to the fact that the war was entered upon without previous planning or forethought. The findings of the Dodge Commission (Grenville M Dodge, q.v.) appointed by President McKinley to investigate the conduct of the war, resulted in certain important changes in the organization of the Medical Department, to which Surgeon General Robert M O'Reilly (qv) devoted his administration (1902-1909). These changes were to prove the main factors of success in our medical arrangements for later wars

The Dodge Commission, as a result of its investigation, recommended for the Medical Department a larger force of commissioned officers, authority to establish in time of war a volunteer hospital corps; a reserve corps of selected trained female nurses; a year's supply of all medicines, hospital equipment, and stores for an army at least four times the actual strength, to be held constantly on hand in medical supply depots; a better arrangement for the transportation of medical supplies, the simplification of administrative paper work, the creation of a fund for the purchase of special diets for the sick; and more adequate accommodations for the transportation of convalescent soldiers. Practically all of these recommendations were carried out during the administration of Surgeon General O'Reilly

The military forces in Cuba, Puerto Rico, and the Philippines accomplished what they set out to do in good time and without difficulty, but the severe incidence of inalarial and yellow fevers among troops in Cuba necessitated withdrawal of the aimy from the island, once the main object of the expedition had been accomplished. A board, composed of Walter Reed, Victor C. Vaughan (qq.v.) and Edward Shakespeare, made an exhaustive study of the typhoid fever epi-

demic in the military camps and published a very valuable report. The outstanding conclusion reached was that typhoid tever was not necessatily always a waterborne disease, and that its spread during the war was largely through intimate contact. The role of typhoid carriers

was not then understood

The appalling typhoid incidence during the Spanish-American War was the motivating influence in the Medical Department's intensive and successful search for a protective vaccination against this scourge By 1908 the results of experimentation in the British Army in India were sufficiently promising to justify Surgeon General O'Reilly's sending Mai Frederick Fuller Russell to England and Germany to investigate the subject. On his return Russell submitted a report on the epidemiology and control of the disease A board of eminent members of the newly constituted Medical Reserve Corps conwend to consider the subject; it recommended the use of typhoid vaccine in the army. This report was approved by the War Department and voluntary antityphoid vaccination was commenced in the military establishment in 1909. Such vaccination has been compulsory in the military service since 1911

Environmental sanitary measures have undoubtedly had their effects in lowering the inci-dence of typhoid fever, yet the remarkable decrease in the admission rate of this disease from 353 per thousand per annum in 1908 to 0.78 per thousand in 1911 and 0.03 per thousand in 1939 is significant of the success of typhoid vaccination in the United States Army. During World War I the admission rate was 0.37 per thousand as against 141 per thousand in the Spanish-American War

The Philippine expedition dispatched soon after the Battle of Manila Bay was a force composed of regulars and volunteers. The medical service was a regenerated organization composed of an administrative overhead of regular medical officers, volunteer surgeons, and contract sur-This force encountered all of the usual tropical diseases in the Philippine Islands, which caused high morbidity and mortality Cluef among these were malarial fevers, dysentery, and sprue So excellent had been the results of vac-cination on the population of Puerto Rico in 1898 that it was duplicated in the Philippines, where smallpox had ravaged the islands for centuries There also the application of the principles of preventive medicine and practical sanitation resulted in markedly lessening the admission rate for these infectious diseases

Important research work performed by the Medical Department of the army resulted in the demonstration by Maj Walter Reed and his three associates, James Carroll, (qv.), Jesse Lazear and Aristides Agramonte (q.v.), of the transmission of yellow fever by the mosquito By a most careful and scientific investigation they positively demonstrated that yellow fever was transmitted by the bite of Aëdes aegypti. The revolutionary findings were put into such practical application by Gen. Leonard Wood and William C. Gorgas (qq.v.), later surgeon general, that yellow fever does not now exist in United States territory. Undoubtedly Recd's discovery and Gorgas' application of its principles in a practical way enabled the United States to build and maintain the Panama Canal, and the effects upon commerce, trade, and industry in southern

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Two important congressional enactments aflected the organization of the Medical Department between the Spanish-American War and World Wai I The act of Feb 2, 1901 radically teorgamized the military system. The Medical Corps was increased and the Army Nurse Corps was established. The act of April 23, 1908 created the Medical Reserve Corps, which was the first reserve of officers, with the exception of the National Guard, that this country had ever had during its previous military history of 125 years This was one of the most advanced steps taken in military preparedness in the history of the Medical Department. Not until eight years later did the National Defense Act of 1916 establish the Officers' Reserve Corps for each of the arms and other services. During the same period, two new corps were established as commissioned components of the Medical Department—the Dental Corps in 1911, and the Veterinary Corps in 1916

In 1916 and 1917, during the punitive expedition into Mexico, motor ambulances were given then first trial in the military operations of the

United States Army

At the beginning of World War I, the Medical Department was better prepared than it had been for earlier wars. Its numerical expansion kept pace with the rest of the army, and us operations during World War I dwarfed all prior accomplishments, although they were, in turn exceeded by those of World War II. The following table illustrates the expansion of the department during the two wars:

PERSONNEL

TEMBONNE				Woild
6	World	l War I		Wat II
	Apr 6, 1917	Nov 15, 1918	June 20, 1940	Aug 31, 1945
Medical Corps Dental Corps Vetermary Corps Sanitary Corps	833 86 62 0	30,591 4,620 2,002 2,919	1,230 267 126 0	45,300 14,000 2,070 2,500
Medical Administra tive Corps Army Nurse Corps Pharmacy Corps	403 0	21,480 0	72 949 0	19,900 56,000 68
Medical Department Dietitians Physical Therapists Enlisted Men	0	0 0 281,641	0 0 13,628	1,575 1,300 493,000

During World War I, many problems theretofore relatively unimportant or unknown were presented Wounds by high explosives caused a predominence of fracture requiring frontline immobilization prior to evacuations Lacerated immobilization prior to evacuations wounds required débridement and open antiseptic treatment with secondary closure, particularly to avoid ordinary wound infection and gas bacillus (Welch) infection The necessity for early operation in gunshot wounds forced the establishment of surgical and evacuation hospitals as near the front as the military situation would permit. The system of evacuation was expanded for practical use in large-scale operations. The use of airplanes made new demands on personnel operating them and resulted in a new specialty-aviation medicine.

Between the two world wars, major developments in the organization and structure of the Medical Department resulted from the National Defense Act of June 4, 1920 The number of enlisted men was established at 5 per cent—raised in 1940 to 7 per cent—of the total actual demic in the military camps and published a very valuable report reached was that typhoid lever was not necessairly always a waterborne disease, and that its spread during the war was largely through intimate contact. The role of typhoid carriers

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PERSUNEL					
				Woild	
	World War I			War II	
•					
	Apr 6,	Nov 15,	June 20.	Aug 31,	
	1917	1918	1940	1945	
Medical Corps	833	30,591	1,230	45.300	
Dental Corps	86	4,620	267	14,000	
Vetermary Corps	62	2,002	126	2,070	
Samtary Corps	0	2,919	0	2,500	
Medical Administra-					
tive Coips	0	0	72	19,900	
Aimy Nurse Corps	403	21,480	949	56,000	
Pharmacy Corps	0	0	0	68	
Medical Department					
Dietitians	0	0	0	1,575	
Physical Therapists	0	0	0	1,300	
Enlisted Men	6,619	281,641	13,628	493,000	

During World War I, many problems theretofore relatively unimportant or unknown were presented Wounds by high explosives caused a predominence of fracture requiring frontline immobilization prior to evacuations Lacerated wounds required débridement and open antiseptic treatment with secondary closure, particularly to avoid ordinary wound infection and gas bacillus (Welch) infection. The necessity for early operation in gunshot wounds forced the establishment of surgical and evacuation hospitals as near the front as the military situation would permit. The system of evacuation was ex-panded for practical use in large-scale opera-tions. The use of airplanes made new demands on personnel operating them and resulted in a new specialty-aviation medicine.

Between the two world wars, major developments in the organization and structure of the Medical Department resulted from the National Defense Act of June 4, 1920 The number of enlisted men was established at 5 per cent—raised in 1940 to 7 per cent—of the total actual

strength of the army. The proportionate basis which this act established for determining the number of officers in the Medical Department was replaced, in 1939, by allotments for each corps. One new corps, the Samtary Corps, was established during World War I. The act of 1920 established still another corps, the Medical Administrative Corps In addition it gave the Dental Corps the same grades and system of promotion as the Medical Corps, and reorganized the Vetermary Corps The latter did not achieve a system of promotion parallel to that of the Medical and Dental corps until 1935 Members of the Army Nurse Corps gained relative rank in 1920 This accorded them equal rights and puvileges with officers, but not equal pay or command functions

As a result of World War I success in training officers in schools and camps for field service the department established the Medical Field Service School in 1920 To continue the training of flight surgeons and research in aviation medicine, initiated during the war, the School of Aviation Medicine was established in 1919 about the same time, two professional service schools in addition to the Aimy Medical School, were established—the Army Medical School, were established—the Army Veterinary School in 1920, and the Army Dental School in 1922. These three schools, known collectively as the Medical Department Professional Service Schools, were redesignated the Army Medical Department Research and Graduate School in 1946.

1946.

During World War II, the Medical Department profited from its experiences of the previous war Its problems and operations, however, were of far greater magnitude. The dispersion of military forces throughout the world in all kinds of environment intensified the problems of pieventive medicine and multiplied the difficulties of supply and evacuation. New types of military operations—amphibious landings, large-scale strategic and tactical bombing, and highly mobile land warfare—presented new problems of medi-cal support. The medical demands of a military force twice the size of that in World War I taxed the capacity of the country to supply enough physicians for both military and civilian needs. The department's success in achieving its mission in this global war is indicated by a comparison of the mortality rates of the army with those for World War I. In the earlier war, deaths from disease were 16.5 per 1,000 troops per annum, in World War II, the rate was 0.6. The respective death rates among battle casualties reaching medical feedbies were 2 and 4 conties reaching medical facilities were 8 and 4 per

World War II caused important administrative developments in the Medical Department. Advances in medicine and the increasing specialization which occurred between the two wars resulted in a trend, during World War II, toward separation of administrative from advisory and professional functions and in the extension of the consultant system, begun during World War Experts in particular fields of medicine and surgery, appointed as consultants, exerted a potent influence in the determination of policies pertaining to the prevention and treatment of disease. Civilian consultants, placed on a permanent basis in April 1946, gave the Medical Department during the war the benefit of the knowledge of experts in the fields of gastroenterology, cardiovascular diseases, dermatology, infectious dis-

eases, chemotherapy, allergy, tropical diseases Military consultants, through and tuberculosis close supervision of the classification, assignment. and professional work of specialists, contributed to the effective utilization of these scarce types of personnel A further contribution toward that end was the specialization of general hospitals, a procedure first used during World War I, in neuropsychiatry, general surgery, arthritis. neurology and neurosurgery, neurosyphilis, tropical diseases, trench foot, thoracic surgery, amputations, plastic and ophthalmologic surgery, vascular surgery, deep X-ray therapy, radium therapy. blindness, and deafness

To relieve medical and dental officers from administrative and certain professional duties, the Medical Administrative and Sanitary corps were expanded and three new commissioned compoments were established—the Pharmacy Corps, Medical Department Dietitians, and Physical Therapists. In June 1944, an act of Congress gave all female officers of the department full commissioned status in the wartime Army of the United States After the war, a Medical Service Corps replaced the Sanitary, Medical Administrative and Pharmacy corps, and, in April 1947. a Women's Medical Specialists Corps, composed of dietitians, physical therapists, and occupational therapists, was established in the Regular Army The Army Nurse Corps achieved Regular Army status at the same time

Problems in furnishing medical supplies and equipment to aimed forces throughout the world led to an army navy study in the autumn of 1944 of the possibilities of joint procurement. As a result, the Army Navy Medical Procurement Office was established in December 1945.

The increasing importance of the functions of the Army Medical Museum as a reviewing and diagnostic center for the laboratories of the Medical Department resulted in the surgeon general's approval in November 1943 of a new designation for the establishment -- The Army Institute of Pathology The institute served as headquarters for mobile units of artists and photographers, sent into all theaters of operation to provide the Medical Department with photographs and motion pictures of nearly every phase

of medical activity in combat areas

Important advances in the Medical Department's professional functions and in its field service occurred during the war. One of the chief advances in surgical treatment was the concept of wound management which involved the "phasing" of surgical treatment. In the first phase, initial wound surgery was performed in mobile hospitals near the front lines, often within artillery range of the enemy. To bring surgical skill forward to the casaulty, the Medical Department increased the mobility of its field units and organized highly specialized teams to be shifted as the needs of the combat zone de-manded. The second phase of surgical treatment, more definitive and reparative wound surgery, occurred at general hospitals in the communications zone; the third, corrective and rehabilita-tive surgery, at general hospitals in the United States. Of equal importance with front line surgery as a lifesaving measure were air evacuation, which played an increasingly important part as the war continued, and the use of blood plasma, whole blood, sulfonamides and penicillin in theaters of operation as well as in the zone of interior. Medical Department studies and field trials which confirmed the effectiveness and extended the range of usefulness of penicillin bridged the gap between experimentation and practical application with imprecedented speed

The Medical Department's success in preventing and treating diseases equaled that of saving casualties The sulfonamides and penicillin proved effective in the prevention of meningococcal infections and complications of upper respiratory infections, and in the treatment of bacillary dysentery, gonorthea, syphilis, and diseases caused by staphylococci, streptococci and pneumococci. The extension of established policies of immunization and sanitary discipline decreased the incidence of typhoid and paratyphoid fevers in World War II to about one seventh that of World War I Only thuteen cases of cholera and only twelve of tetanus occurred in the entire army despite the fact that the former was epidemic or semiepidemic in a number of areas where troops were stationed, and that much of the fighting was over terrain heavily infested with the spotes of tetanus. The most significant development in the control of insect-borne diseases was the adoption of DDT It proved singularly effective in the control of a serious epidemic of typhus in Naples during 1943 and 1944 and played an important part in controlling malaria, the disease of greatest strategic importance in World War II

Consonant with the aimy's mission of conserving manpower, emphasis in the care of neuropsychiatric casualties was shifted from "diagnosis and disposal" to prevention and treatment of psychiatric disorders. The effective use of a well-balanced program of physical, educational, and occupational reconditioning in the treatment of neuropsychiatric cases, and in hastening the convalescence of other patients led to the estab-lishment in November 1946 of a physical medicine service, designed to coordinate and integrate the use of physical reconditioning, occupational therapy, and physical therapy in a well-rounded therapeutic program under professional super-

vision

Since V-J Day the Medical Department has declined greatly in numbers—to 52,350 officers and enlisted personnel (October 1947). Its responsibilities are still global, however, reaching wherever American forces are stationed. mcreasing importance of the Army Air Forces, reflected during the war in the growth of a semiautonomous air forces medical service, has resulted in the separation of the air forces from the army. Important organizational and operational problems in the medical services of the two

forces are now in the process of solution Functions.—The Medical Department is a noncombatant branch of the army. Its personnel, equipment, and supplies, except those of the Veterinary Corps, are protected by the provisions of the Geneva Convention. Nevertheless, it deals with the whole combat force, and, in every tactical operation in time of war, it executes a major withdrawal in the evacuation and hospitalization of casualties The fact that withdrawal of noneffectives must be made against the forward flow of troops and supplies, yet with the least possible interference with this flow, adds to the difficulty of the task Casualties to be evacuated are gathered individually from all units of the field force and are neither organized nor selfsupporting. Evacuation to the rear must be carried out as a piecemeal process by the successive medical echelons of higher units. of transportation range from the hand litter to the hospital train and airplane ambulance, and medical installations are usually located at points where the transition from one kind of transport to another occurs

Major duties and responsibilities with which the Medical Department is now charged are as

follows

(1) The conduct of physical examinations for those entering the army
(2) The preservation of health and the prevention of disease among the personnel subject to or assigned to army control, including the inhabitants of occupied territory
(3) The provision of medical, surgical, and dental care, including the maintenance of prescribed medical establishments and units, for sick and wounded personnel, and the methodical disposition, including transportation, of such personnel, with prompt restoration to duty of those rendered capable and removal of those incapacitated rendered capable and removal of those incapacitated (4) Proper selection, classification, and training of

(4) Proper selection, classification, and training of Medical Department personnel
(5) The operation of a veterinary service, including both the conservation of health of public animals, and the inspection of meat and dairy food products.
(6) The procurement, storage, issue, and maintenance of medical supplies and equipment
(7) The research and experimentation connected with the development and improvement of Medical Department material, equipment, and supplies material, equipment, and supplies
(8) The preparation and disposition of records and

reports

In the coordination of its policies on an armywide basis the Medical Department works closely with other branches of the Department of the Army: with the Quartermaster Corps in the development of army rations; with the Coips of Engineers in the construction of hospitals; and with the Chemical Corps in research on the medical aspects of chemical warfare. Long-existing relations with the Bureau of Medicine and Surgery of the navy have been strengthened by the inclusion of the departments of the Army and the

Navy in one military establishment

In areas in which the status of health of army personnel impinges upon general public health, as in the prevention and cure of the venereal diseases, and in measures taken to prevent the entry into the United States of communicable diseases from abroad, the Army Medical Department cooperates with the Public Health Service and with local health authorities It receives the aid, intensified during war, of a variety of quasi-governmental and private agencies, especially in the field of medical research (see section on Research and Development) The National Red Cross which aided with the provision of certain medical supplies, notably whole blood, and with the recruitment of army nurses in World War II, furnishes recreational and social workers at army hospitals

Organization — The Medical Department of the army is now under the jurisdiction of the Department of the Army within the National Military Establishment, following the National Security Act of July 26, 1947, which united the army, navy, and air forces in a single organization. The Medical Department consists of a surgeon general, four assistants, the Medical Corps, the Dental Corps, the Army Nurse Corps, the Veterinary Corps, the Women's Medical Specialist Corps, the Medical Service Corps, Medical Department enlisted personnel, and a small number of contract surgeons Contract surgeons are civilian physicians appointed by the surgeon general to meet emergency professional needs in situations where it is impracticable to maintain a

medical officer. Under the National Defense Act, as amended by the Officer Personnel Act of 1947, the surgeon general and one of his assistants, who must be an officer in the Dental Corps, have the rank of major general, while the three other assistants have the rank of major general or brigadier general, as determined by the secretary of the army The surgeon general and assistants are appointed by the president for four-year periods must be of the grade of lieutenant colonel or higher and must be recommended for the office to which they are appointed by a board of officers established for the purpose by the secretary of

The officers of the several corps of the Medical Department and its enlisted members are distributed in all United States Army stations throughout the United States and its overseas possessions and in stations located in areas under United States Army occupation The sanitary and health supervision at each station falls under the jurisdiction of the station surgeon, an officer of the Medical Corps, who is responsible to the station commander for all matters affecting the health of the command. He has charge of the conduct of sanitary inspections, the station veterinary activities, including the meat and milk inspections made by his veterinary assistant; the supervision of the station hospital, or dispensary, with its staff of medical and dental officers, and often nurses, the training of the Medical Department enlisted men, and, in stations having tactical organizations, the furnishing of medical personnel and supplies during training excursions in the Each army and major tactical force in field the field also has its surgeon and medical headquarters, together with attached hospitals and other medical units.

Since most military stations and establishments in the United States fall under the control of the six aimy commanders of the six areas into which the country is divided, the medical activities of stations in each area come, in an administrative sense, under the Medical Department adviser to the army commander, an officer of the Medical Corps known as the army surgeon Panama, Hawan, and Puerto Rico such medical supervisors are called department surgeons On his immediate staff each army and department commander has an adviser of the Dental Corps and one of the Veterinary Corps.

Principles and policies governing the operation of the medical service of the army are promulgated by the secretary of the army as compulsory regulations These policies are established on the advice of the surgeon general, who is a member of the technical and administrative staff of the Department of the Army. The surgeon general is thus able to formulate a uniform policy of medical service, carried into effect as a requirement by all army and department com-manders through their Medical Department personnel and other subordinates, in all military stations and establishments both at home and overseas

The operations of certain medical establishments, however, are under the direct command and administrative supervision of the surgeon general Such establishments include the Army Medical Center (q.v) at Washington, D C composed of Walter Reed General Hospital, Medical Department Research and Graduate schools, Central Dental Laboratory, Army Prosthetics Research Laboratory, and Veterinary Research Laboratory; Fort Totten Army Medical Center

at Fort Totten, New York, Brooke Army Medical Center at Fort Sam Houston, Texas, comprising Brooke General Hospital, the Medical Rield Service School, the Fourth Army Area Laboratory, the Surgical Research Unit, and the Central Dental Laboratory; the Army Institute of Pathology in Washington, the Army Medical Library in Washington, together with the Cleveland branch of the library, four medical depots and medical sections of certain general depots: certain specialized laboratories, and the general hospitals. The general hospitals are-in addition to Walter Reed and Brooke -Army and Navy (Hot Springs, Ark), Fitzsimons (Denver, Colo), McCormack (Pasadena, Calif.), Murphy (Waltham, Mass), Olivei (Augusta, Ga), Percy Jones (Fort Custer, Mich), Valley Forge (Phoenixville, Pa), William Beaumont (El Paso, Texas), Letterman (San Francisco, Calif), Madigan (Tacoma, Wash), and Tilton (Fort Dix, N. J) General hospitals provide definitive treatment and prolonged hospitalization Post, camp, or station hospitals, on the other hand, provide treatment for less serious cases of local origin for limited periods. The latter are under the command which has jurisdiction over the post, camp, or station at which they are located

These and all other medical establishments having a more or less fixed location in the United States and its possessions, "named" units, are distinguished from the more or less mobile units designed to serve aimies in the field. The latter, "numbered" units, have a standardized form of organization and include additional varieties of units appropriate to work in the field. They may be roughly divided into three categories: (1) those whose main function is to provide care and treatment (such as clearing companies and various types of hospitals echeloned farther toward the rear); (2) those whose primary purpose is to provide transportation from the battlefield at successive stages in the chain of evacuation (the medical detachments of regiments, the collecting companies, hospital-train units, ship platoons, etc.); and (3) certain ancillary units not directly concerned with the care or transportation of patients (depot companies and laboratories). As indicated above, the evacuation of sick and wounded takes place through a chain of medical stations which provide progressively more elaborate treatment as the rear areas are reached. The transporting agencies, however, from the litter bearers in the medical detachments at the front through the hospital train and other units farther to the rear, supply emergency treatment while patients are in their hands. A variety of specialized detachments (blood transfusion, auto maintenance, supply, hands. etc) also exist whose function is to supplement or support certain principal units in the three categories mentioned above.

The Medical Department is continuing the system of affiliated units which made effective contribution to the medical service in World War These units are established in civilian medical schools and hospitals. Organized and trained in a reserve status, they consist of personnel assigned to specific duties and accustomed to working together, and are therefore prepared to render efficient service whenever called to active

duty
The Surgeon General's Office.—The central bureau of the Army Medical Department is

the Surgeon General's Office located in Washington, D.C. The surgeon general is not only cluef of the Medical Department but also senior medical technical staff officer of the Department of the Army. In the latter capacity he acts as medical adviser to the secretary of the army, the army cluef of staff, the army general and special staffs, and other components of the Department of the Army. His command responsibilities include command of such troops and activities as may be assigned to his control by the Department of the Army.

In the absence of the surgeon general, the deputy surgeon general acts in his stead. An executive officer supervises the administrative operations of the Surgeon General's Office. Principal units of the executive office are the administrative office, which attends to general office needs for supplies and equipment, distribution of all communications, the filing of records, and printing and duplicating services; the legal office, which serves as general counsel, and the editorial branch, which publishes the Bulletin of the U.S. Army Medical Department, a monthly periodical designed primarily to keep Medical Department personnel informed on developments in military medicine, including the dental and vetermary fields.

A deputy for plans has responsibility for the preparation of long-range plans and policies designed to solve major Medical Department problems. Technical aspects of plans peculiar to the work of specific divisions of the Surgeon General's Office are handled by these divisions

eral's Office are handled by these divisions

The number and character of divisions and their component elements shuft from time to time as various phases of the Medical Department's work increase or decline in importance. The field of work of currently operating divisions is described below

Four divisions are concerned primarily with operations of four of the corps of the Medical Department: the Dental, Veterinary, Nursing, and Medical Service Corps divisions. The last-named division is concerned with the newly established corps of the same name which assumed the functions of the former Medical Administrative, Sanitary, and Pharmacy corps.

Five other divisions reflect the emphasis placed upon the use of civilian consultants in special fields in World Wai II, the Medical Consultants, Physical Medicine Consultants, Surgical Consultants, Dietetic Consultants, and Neuropsychiatry Consultants divisions. These, composed of specialists, have the responsibility of adapting to army needs the best professional practices in their respective fields.

The preventive medicine division develops and supervises programs for sanutation and prevention of disease for the army and for areas under army control, including a program for the establishment of good health conditions in industrial plants operated by the army. In addition to its analysis of disease incidence data within the army, it analyzes medical, epidemiological, and sanutary data in foreign areas insofar as they affect the army. It also supervises the medical laboratory service of the army.

The personnel division has charge of the staffing of all Medical Department activities with both military and civilian personnel through such procedures as recruitment, classification, assignment, promotion, and separation.

The education and training division plans and

supervises programs for training commissioned and enlisted personnel in medicomilitary subjects and devises training aids.

The procurement of medical supplies and equipment is now handled jointly with the navy at the Army-Navy Medical Procurement Office, Brooklyn, N Y. For the army side of the program the supply division of the Surgeon General's Office determines needs of both the army and of civilians dependent on it in occupied territories, supervises procurement through the Army-Navy Medical Procurement Office, and supervises distribution through the chain of medical supply depots and using agencies

The hospital division plans and supervises the operations of the program for the evacuation of the sick and wounded and for their hospitalization. It also makes recommendations concerning the construction, lease, and maintenance of army beautiful.

The resources analysis division attempts to match requirements of the Surgeon General's Office as to personnel and facilities with the available resources.

The medical statistics division analyzes statistics pertaining to the health of the army and reports its findings

The special projects division handles medical problems incident to the development of special weapons

The fiscal division maintains accounts pertaining to the expenditure of Medical Department funds, makes budget estimates, and prescribes fiscal standards and procedure

The Medical Research and Development Board (see below) has functions which are sufficiently indicated by its name

indicated by its name.

Medical Department Officer Corps.—The Medical Department of the Regular Army comprises six officer corps There are also now on duty Reserve officers and officers temporarily commissioned in the Army of the United States in each of these corps The Officer Personnel and the Army-Navy Nurses acts of 1947 established the quotas and the promotion regulations for the Regular Army segments of these corps. Thus the Army Nurse Corps has a Regular Army authorized strength of six per thousand of army strength, and the Women's Medical Specialist Corps a strength of nine tenths per thousand Individuals may be commissioned in other Regular Army corps in such numbers as the service may require with the general limitation that the total number of Regular Army officers in all branches of the army must not exceed 51,000 The Officer Personnel Act established separate promotion lists for the Regular Army members of the Medical, Dental, Veterinary, and Medical Service corps; their promotion is based on length of time in grade and past performance for all grades above first licutenant, as in the case of all other Regular Army officers. However, to compensate for the extra years of education required by their profession, officers appointed to these lists after Jan. 1, 1948 receive constructive service credits for promotion purposes. These credits amount to four years for physicians, three for dentists, two for veterinarians, and three for members of the Medical Service Corps possessing a degree of doctor of philosophy or comparable degree recognized by the surgeon general in a science allied to medicine. Officers commissioned in the Regular Army in these corps during 1946 and 1947 received service credits based on age and military

service to assure them proper grade and seniority on their list Officers receiving Regular Army appointments in the Veterinary, Army Nuise, Medical Service, and Women's Medical Specialist corps are credited with an amount of service equivalent to the period of active commissioned service performed subsequent to Dec 31, 1947, up to a maximum of five years. All Regular Army officers must take an annual physical examination to qualify for continued service, and all such officers in the Medical, Dental, and Vetermary corps must pass a professional examination as one prerequisite to promotion. In most branches of the Regular Army officers are appointed without refetence to the corps in which they serve In the Medical Department, however, appointment is made to a specific corps Base pay and allowances of all officers are fixed in the Pay Readjustment Act of 1942, as amended in 1946 All officers in the Medical Department are

classified for service to conform with their training and experience in civilian and military life Every effort is made to give professional rather than administrative assignments to those desiring and qualified to perform them Medical and Dental corps officers are encouraged to seek certification by the specialty boards in order to achieve the highest standards of professional com-

Medical and Dental Corps.—These commissioned components of the Medical Department comprise groups of graduate physicians and dentists. Appointees to these corps must be graduates of a medical or dental school acceptable to the surgeon general and legally authorized to confer the degree of doctor of medicine or doctor of dental surgery, or its equivalent A candidate for the Medical Corps must also have had an internship acceptable to the surgeon general, or its equivalent in practical or professional experience as determined by the surgeon general Minimum age for a Regular Army appointment is 21 years, and candidates for grade of first lieutenant may not be over 32 years of age, except by special permission Above first lieutenant the grade to which a person is appointed is determined by his age and amount of professional practice, including residencies and postgraduate training; no commissions are granted in the Regular Aimy in grades higher than colonel By an act of Congress (1947), Regular Army officers of these two corps receive supplemental pay of \$100 a month; all other members receive the same amount if they volunteer for a year of active duty

Veterinary Corps - Applicants for commission in this corps must have been graduated from a veterinary school acceptable to the surgeon general and legally authorized to confer the degree of doctor of veterinary medicine, or its equiva-lent Minimum age for Regular Army appointment is 21 years, and maximum 32; however, the maximum age limitation for any person who served in the armed forces of the United States prior to Sept 2, 1945 may be waived by the secretary of the army until June 30, 1953. Applicants for Regular Army commissions must complete a one-year period of trial service, and initial appointments are ordinarily made in the grade of second lieutenant After one year the officer is promoted to first lieutenant, and subsequently to higher grades according to the promotion schedule.

The duties of Veterinary Corps officers fall into two general classes: those pertaining to the

inspection of foods of animal origin for consumption by the army, and those having to do with the care and treatment of aimy animals The members also train and direct the enlisted personnel of the Medical Department assigned for duty to the corps, investigate and make recommendations on the hygiene and sanitary conditions of the animals of the army, and inspect forage when procured, stored, and issued As the number of animals used in the army has decreased. food inspection has assumed relatively greater This includes methods and proimportance cedures by which such foods are transported. stored, and made available for troop consumption

Medical Service Corps - This corps consists of four sections, the names of which suggest the functions performed pharmacy, supply, and administration, medical allied sciences, sanitary engineering, and optometry The corps performs such functions as the secretary of the army may prescribe, and he may create such other sections as he deems necessary Grades range from second heutenant to colonel With certain exceptions the minimum age for Regular Army commissions is 21 years and the maximum 30 Each applicant must complete a one year trial tour of

Army Nurse Corps Original Regular Army appointments to this corps are given to those women who are between the ages of 21 and 27 years inclusive, who have been graduated from a school of nursing approved by the surgeon general, are registered nurses, and members of the Army Nurse Corps Reserve. Such applicants must be unmarried and are appointed in the grade of second lieutenant. Grades in this corps range to heutenant colonel, except for the chief, who holds the temporary rank of colonel during her four-year term Retirement is authorized although not mandatory, after 20 years' service in the corps.

Women's Medical Specialist Corps - Minimum and maximum age limits for initial Regular Army appointments in this corps are 21 and 28 years respectively. Such applicants must be college graduates and have additional training prescribed by the surgeon general Dietitians supervise the preparation of food, including special diets, for patients in army hospitals. Physical and occupational therapists, acting upon the prescription of a medical officer, perform or supervise physical or occupational treatment of patients and train personnel of the Medical

Department in such techniques.

Officers' Reserve Corps — This component of the army consists of commissioned civilians qualified and willing to serve as officers in times of emergency. Each of the six corps in the Medical Department has its section in this reserve In this interim period between hostilities and the final establishment of our peacetime army, not all policies relating to the Officers' Reserve Corps have been settled (1948) Grades range from second heutenant to general officer Anyone honorably discharged from service during World War II in commissioned status, or from the first three grades of noncommissioned rank, is eligible for appointment in the Reserve Appointment holds good for five years and may be renewed. At present any officer may, with his own consent, be ordered to active duty for such time as the president may prescribe In time of national emergency, declared by Congress, he may be so ordered without his consent. An officer in this corps receives the pay and allowances of his grade while on active duty. Retirement age is

60 years

The Honorary Reserve consists of officers retired from the Regular Army on account of age, those who have completed 20 years' service in the Reserve Corps, and those who have become physically disqualified through no fault of their

The Officers' Reserve Corps forms the largest source of expansion to meet emergencies short of war, and with the increase of the army, beginning in 1939, Reserve officers of all sections, including those in the Medical Department, were called to active duty in ever-increasing numbers. They formed the bulk of officers on active duty at the time of Pearl Harbor. Classification of Medical Department Reserve officers according to civilian and military experience was initiated in 1940, and these officers performed practically every type of duty called for in the Medical

Department

Consulants — Highly trained specialists, either civilian or military, may be designated as consultants in the Medical Department. Consultants are assigned to the surgeon general, the surgeons of the Department of the Air Force, Army Ground Forces, and major commands, and the commanding officers of hospitals and other medical installations. In the general hospitals a large part of their time is occupied with the graduate instruction of Medical Department officers. Elsewhere they act as advisers and assistants in evaluating and improving the quality of medical and surgical treatment and preventive medicine About 1,000 consultants, mostly civilians working on a part-time basis in the general hospitals, are now employed by the Medical Department.

now employed by the Medical Department

Medical Department Insignia.—The distinguishing emblem of the Medical Department, exhibited on the guidons of its organizations and worn as insignia on the uniform of its members, is the caduceus. As an openwork metal pin on the lapel of officers' uniforms, this device is worn plain by Medical Corps officers or has superimposed upon it small letters identifying those belonging to the other Medical Department corps; as Dental Corps (D); Veterinary Corps (V); Army Nuise Corps (N); Women's Medical Specialist Corps (MS intertwined), Medical Service Corps (MS intertwined); and Contract Surgeons (C). For the Women's Medical Specialist Corps and the Medical Service Corps the cadiceus is silver plated; for all others, gilt. Enlisted personnel wear a solid metal button with an unadorned caduceus in high relief.

Training.—The rapid (almost precipitous) demobilization of the army at the close of World War II and the implementation of the army-wide, long-range "Gerow-Board plan" for the postwar training of officers required of the Medical Department not only a drastic consolidation of its facilities for formal training but also a radical revision of its wartime educational system both

for officers and enlisted men.

Except for the tactical training of units under control of the Army Ground Forces and on-the-job training received in all Medical Department installations, the Army Medical Department, within two years after the end of hostilities, had concentrated most of its formal training at the following centers: the Medical Field Service School (Brooke Army Medical Center, Fort Sam Houston, Texas), the Army Medical Department

Research and Graduate School (Army Medical Center, Washington, D. C.), the Medical Department Meat and Dairy Hygiene School (Chicago Quartermaster Depot, Chicago, Ill.), the St. Louis Medical Depot (St Louis, Mo.), five general hospitals within the United States, and one hospital in the Canal Zone operated by the civil government but staffed by army medical officers. Additional Medical Department training was being given at numerous civilian medical schools and in certain army hospitals in Europe. By the early months of 1948, the postwar training program of the Army Medical Department was about 75 to 80 per cent operative. Since the plans were firmly drawn, however, it was expected that the program would soon be functioning at capacity

Departing from its practice during most of World War II the postwar Medical Department does not give basic training to newly enlisted men Instead, enlisted personnel destined for service as medical soldiers receive basic military training for about three months in one of the four training divisions of the Army Ground Forces. At the conclusion of this training a certain number of enlisted men are assigned to the Medical Department either as replacements (who immediately start on-the-job training), or as candidates for advanced training in medical and related subjects in the several service schools operated by or in cooperation with the Medical Department. Replacements, if qualified, are also encouraged to

take advanced training

As markedly demonstrated during World War II, one of the most important training agencies producing medicomilitary manpower is the Reserve Officers Training Corps program conducted in selected four-year medical schools Approximately twice as many medical schools as in prewar years are participating in the revival of this program, and plans call for its early extension to schools which will train officers for the Dental, Veterinary, and Medical Service corps reserve. The selected medical schools and the Department of the Army assume joint responsibility for the operation of the ROTC units. A medical officer of the Regular Army, serving as instructor in military science and tactics, is assigned at each school to conduct the medicomilitary instruction; for its part the school insures a membership of at least 50 students—all of whom must be citizens of the United States and physically suitable for military service—and provides for 90 hours of instruction each year in certain medicomilitary subjects. Membership in the ROTC units is generally voluntary Prescribed courses of instruc-tion, which incorporate war-learned lessons in such subjects as medical aspects of atomic energy, preventive medicine, health and national security, military psychiatry, and field medicine and surgery, extend throughout the four years of medical school curriculum, the first two years of which constitute the basic and the last two the advanced course Attendance for six weeks at a summer training camp is also required Subject to availability of funds, selected individuals who complete the basic are enrolled in the advanced course and receive a nominal compensation for their at-Upon completion of the advanced tendance course and upon recommendation of the instructor in military science and tactics and the school authorities, the ROTC graduate is given a com-mission in the Medical Corps Reserve of the army. Qualified reservists, like other graduates

of approved medical schools, may then apply for

a commission in the Regular Army

All Medical Department officers newly commissioned in the Regular Army, unless excused because of prior service, will be required under the postwar program to take military training in a four-month "basic branch course," the first class of which is scheduled to begin in September 1949 A similar eight-week basic course for Medical Department female officers is planned to run twice annually for army nurses and for members of the Women's Medical Specialists Corps After completion of such basic military training, an officer may be assigned at once to duty, or he may either then or later be selected for advanced training in medical or related subjects

Selected enlisted personnel of the Medical Department are given advanced training in medical and allied subjects at an appropriate service school Some are instructed, for example, in the procedures of pharmacy, dental laboratory, medical laboratory, or X-ray; others are trained as medical, surgical, or neuropsychiatric technicians or as psychiatric social workers' assistants, electroencephalographers, physical reconditioning in-structors, or medical aid men Still other enlisted men are given in-service training as specialists in the repair of medical equipment, as opticians, or as inspectors of meat and dairy products.

Medical Department officers, with proper approval, may receive advanced professional or related training at service schools, at civilian institutions, and at the newly designated "teaching" hospitals In the service schools an army medical officer may take a course in the basic sciences, a Medical Service Corps officer may elect to study physical reconditioning, clinical psychology, hospital administration, or psychiatric social work—or he may choose to train as an optician, a supply officer, or a medical equipment maintenance officer, and a hospital dietitian of the Women's Medical Specialists Corps may enroll in a class in mess administration Similarly, Vetermary Corps officers and army nurses may take service school courses appropriate to their professions. When unavailable at service schools, furthermore, courses in the professional specialties, such as internal medicine, thoracic surgery, or obstetrics, in dentistry; and in other fields related to the duties of Medical Department officers, such as business administration, bacteriology, public health, or sanitary engineering, may be secured for limited periods under army contract with an approved civilian institution offering the course desired.

The development in this postwar graduate professional educational program expected to produce the greatest improvement in professional service rendered by the Medical Department is the establishment of internships and residencies in the six teaching hospitals-Brooke, Fitzsimons, Letterman, Oliver, and Walter Reed General Hospitals in the United States, and Gorgas Hospital in the Canal Zone Although by early 1948 no one of these hospitals had residencies approved in all of the professional specialties, collectively they had available for Regular Army Medical Corps officers, and for applicants for the Regular Army, programs of one- to three-year residency training in each of the following fields. cardiology, contagion and tuberculosis, dermatology and syphilology, internal medicine, physical medicine, anesthesiology, obstetrics and gynecology, ophthalmology, orthopedic surgery, otolaryngology, surgery, thoracic surgery, urology, neurology, pathology, psychiatry, and radiology All of these residencies by early 1948 had been approved, some temporarily, many permanently, by the American Medical Association's Council on Medical Education and Hospitals and by the American Specialty boards. Several of the hospitals had residencies, notably in pediatrics, approval of which had been recommended by the council but which had not been acted upon by the appropriate specialty board Some had established residencies in certain specialties pending approval of the accrediting agencies. All six had internships that were permanently approved

General direction of the program for the training of residents and interns is vested in a committee of professional experts in the Office of The Surgeon General The program in each hospital, under the local direction of the hospital education committee, is so organized as to be carried out by a professional staff of assigned Medical Corps officers and attending civilian consultants who are diplomates of, or are acceptable to, the particular specialty board concerned. The third- and second-year residents, too, are expected to supervise and instruct the interns and residents who are less experienced than they - Instruction is accomplished through bedside and general conferences with, and supervision by, the assigned and attending professional staff, through training in the allied sciences, which may be taken locally in civilian institutions, and through indvidual research projects. Residents completing the prescribed comes of study are eligible to take the examinations for certification by the appropriate American Specialty board.

All Regular Army medical officers, if possible between the third and tenth year of their active service, are expected to attend the adanced branch comse, which is divided into two phases the four-month tactical and administrative phase, to be given at the medical Field Service School, and the professional phase, extending from four to nine months, depending upon the type of specialized training, which is to be given at the Army Medical Department Research and Graduate School.

All training opportunities afforded Regular Army officers, except residency training, are also available to Medical Department officers in the

Officers Reserve Corps and National Guard. Beginning in January 1948, the Medical Department instituted in overseas hospitals a program offering advanced training and experience, analogous to residency training, in the various special fields of medicine and surgery to qualified Reserve officers, regardless of prior military service, who applied for extended active duty.

Finally, a limited number of Medical Department officers, in preparation for positions of great responsibility, are usually sent annually to four high-level service schools. Some attend the tenmonth courses at the Command and General Staff College, the National War College, or the Industrial College of the Armed Forces. Others take the five-month course offered at the Armed Forces Staff College. Seldom does any one officer, however, receive advanced training at all four of these institutions.

Research and Development.—Medical Department scientific activities are directed primarily toward discovery of more effective methods for prevention or eradication of conditions that may jeopardize the success of troops during military operations. These activities, like scientific work

in general, are divided into two main categories: (1) research, involving the discovery of basic principles of medical phenomena, and the application of these principles, generally comprehending discovery of a novel product, process, or technique, and (2) development, in which experimental production and testing is performed on products, processes, techniques, or devices that previously have been discovered or invented Applied research and development receive the main emphasis

A considerable amount of scientific work is carried on in the hospitals, laboratories, and testing installations of the Medical Department, as well as in its schools, incidental to, or in close relationship with their ordinary professional duties The large number of specialized centers for treatment of disease, injuries, and wounds, which are organized in waitime, afford great opportunities for clinical observations. Unfortunately, time does not always permit these opportunities to be used Before World War II, however, an orgamzed, comprehensive, and long-range program of research and development was scarcely known in the Medical Department. In earlier years, particularly, it was customary to assign research problems to temporary boards or commissions of medical officers. Among the most notable of these were the boards for the study of tropical diseases set up in Cuba and the Philippines soon after the end of the Spanish-American War Between World War I and World War II, a number of more permanent units specializing in research and development existed A Medical Department Research Board functioned in the Philippines from 1922 to 1934, when it was transferred to Panama. There, under the name of Aimy Medical Research Board, it operated until 1939. Although the board conducted investigations into a variety of subjects, it devoted its chief attention to tropical and animal diseases, and not only demonstrated the exact mechanics of transmission of dengue by Aedes aegypti, but also developed a vaccine which was effective in eliminating rinderpest from the Philippines

Nearly half of the Medical Department's research and development units of the betweenwars period (those concerned with aviation and chemical warfare medicine) functioned, at least m part, under the jurisdiction of other branches of the army, and even, in the case of aviation medicine, with funds not provided by the Medical The beginnings of an attempt to Department integrate the scientific program of the department occurred in 1937, when a research coordinating board to investigate diseases and conditions affecting health, efficiency, and longevity of army officers, and to coordinate other medical research programs was established in the Office of The Surgeon General.

With the coming of World War II, increasingly large appropriations were made from Medical Department funds for research and develop-ment, particularly after the United States entered the conflict. Studies were initiated in the field of communicable diseases, and, toward the end of the fighting, in the development of devices to aid the New facilities were created within disabled. the Medical Department for investigation of respiratory diseases, of industrial hygiene, and the physiology of the armed forces. However, for physiology of the armed forces. much of the more fundamental study required by the war, the Medical Department, because of the great pressure on the time of its personnel, relied

upon contracts with universities and medical schools as well as upon projects organized by the National Research Council (qv) and the Committee on Medical Research of the Office of Scientific Research and Development

The postwar research and development program has attained a magnitude and scope unprecedented in peacetime Whereas, during the fiscal year 1938-1939, \$14,500 of Medical Department funds were specificially obligated for this purpose, the corresponding amount set aside for the fiscal year 1947-1948 was (as of December 1947), \$3,100,000 Studies are made on the medical aspects of operations under climatic extremes, physical and mental standards for the most effective selection and employment of personnel, care and rehabilitation of casualties, prevention and treatment of infectious and parasitic diseases of military significance ordinarily not found among civilians, and adaptation of medical supplies and equipment both to scientific advances and to

changing military practices World War II brought increasing centralization in the control of Medical Department scientific activities. To integrate such work a series of agencies in the Office of The Surgeon General replaced the weak coordinating board. This process culminated in the organization, in July 1945, of the Army Medical Research and Development Board. The membership of this unit, which, since the middle of 1947, has been known as the Medical Research and Development Board, includes the chiefs of the more important professional units of the Surgeon General's Office, the chief of the supply division, the ground surgeon, and the air surgeon. The mission of the board is to formulate and supervise a coordinated research and development program of prospective benefit to army medical equipment and practice, to adapt to the needs of the military service the best techniques and devices produced by private medical research, and to coordinate the Medical Department's research program with those of all appropriate government agencies.

Functioning under the general direction and supervision of the Medical Research and Development Board is the Army Epidemiological Board, established early in 1941 to provide the surgeon general with consultative service on influenza and other infectious diseases as well as to organize research in these fields. The board consists of civilian consultants and has under it five commissions, likewise civilian in membership, which deal respectively with acute respiratory diseases, influenza, virus and rickettsial diseases. immunization, and environmental hygiene

The Medical Research and Development Board also finances and controls a number of installations engaged in research work. clude the research units of the school at the Army Medical Center The divisions of the school are among the oldest of the medical research establishments of the army, and the importance of their scientific activities led to their redesignation as the Army Medical Department Research and Graduate School in January 1947. Their studies cover medical and surgical practice, preventive medicine, and diagnostic methods, as well as development of vaccines The board also has direct control over the Army Prosthetics Research Laboratory, which was established as part of Walter Reed General Hospital in September 1945 and later made a separate component of Army Medical Center, and the Brace Research subsection of

the Hospital's Orthopedic section, which originated in a project authorized in August 1945 The board likewise controls the Medical Nutrition Laboratory, which was orginally situated at Army Medical Center and was transferred to Chicago under an order of September 1944, and the Surgical Research Unit, established about the beginning of 1947 at Brooke General Hospital Studies carried on at the Surgical Research Unit look toward the development of new antibiotics and their surgical application The Medical Department Field Research Laboratory was founded at Fort Knox, Kentucky, in 1942, and was originally devoted to studies of the physiological and psychological aspects of armored warlare. In February 1944 it was transferred from the jurisdiction of the Army Ground Forces to that of the surgeon general, and now operates under the Research and Development Board Since the activities of the establishment soon were broadened to include many other aspects of what may be called military occupational hygiene, its name was changed, effective April 1, 1947, from Armored Medical Research Laboratory to Medical Depart-

ment Field Research Laboratory

The Medical Department Equipment Laboratory, which was established at Carlisle Barracks, Pennsylvania, in 1920, was made an attached activity of the Army-Navy Medical Procurement Office in February 1946 In June of the same year, it became a component of that office and was redesignated as the engineering development division The laboratory and shop branch of this division was moved from Carlisle Barracks to Fort Totten, New York, toward the end of 1947. In its new status, the engineering development division continues to play an important role in the program of the Medical Research and Development Board It is primarily concerned with developmental work on field equipment, such as mobile units, medical chests, dental engines, and operating lamps for the army, navy, and air force. The Medical Research and Development Board also uses hospitals and other Medical Department establishments as occasion may warrant. Among these is the Army Institute of Pathology (see below) which long has had the function of conducting research on the material in its collections. Finally, the Medical Department continues to carry on a large part of its research by means of contracts with universities, medical schools, and other government agencies. Investigations so arranged are those which cannot feasibly be done within the service. They generally involve the more fundamental aspects of research.

Research is also performed under the supervision of Medical Department personnel at the medical division of the Army Chemical Center, Edgewood, Md., on July 15, 1943, the Medical Department Research Laboratory, located at Edgewood, was transferred from the jurisdiction of the surgeon general to that of the chief of the Chemical Warfare Service. Two former army centers for research in aviation medicine, the School of Aviation Medicine at Randolph Field, San Antonio, Texas, and the Aero-Medical Laboratory, at Wright Field, Dayton, Ohio, are now under the jurisdiction of the Department of the

Air Force

The Medical Department's statistical and medical intelligence programs constitute important auxiliaries to its research and development work. Medical intelligence involves the gathering and analyzing of information concerning for-

eign discoveries of importance to military medicine and health conditions and medical facilities in areas abroad which may be the scene of American troop operations

n troop operations

Army Institute of Pathology.—This institute comprises four departments ment of Pathology serves as the central laboratory of pathology not only for the army but also for the Veterans Administration Here many surgical specimens and all of the autopsy material from these two sources are analyzed and original diagnoses are verified or corrected. The department also provides Medical Department officers and other qualified physicians with instruction in pathologic anatomy. The Imerican Registry of Pathology, sponsored by the National Research Council, forms another of the departments of the institute. The registry comprises pathologic materials and records brought together through the cooperation of national societies in the various medical specialties. This material, together with that obtained through official channels, raises the number of accessions in the custody of the insti-tute above 200,000. The Army Medical Illustration Service serves as a central agency for collection and reproduction of medical illustrative material for the army and the civilian members of the profession. A collection of about 400,000 negatives has been amassed. The service supervises the activities of the Chnical Photographic Laboratories of the Army hospitals in the United States, and receives from them moving picture films as well as "stills". It maintains a Photographic Department, dating almost from the Civil War, which pioneered in photomicrography One of its most valuable activities is the presentation at scientific meetings and similar gatherings of exhibits on a wide range of medical subjects. The Army Medical Museum, which is the fourth department of the institute, is the only establishment of its kind which is open to the general public. The world's largest aggregation of war wounds, contrasting the effects of airows, tomahawks, small arms, high explosive shells, and gases, is in the custody of the museum, but its accessions comprehend all forms of injuries and diseases Medical medals, microscopes, stethoscopes, and other diagnostic instruments also are among the collections

Army Medical Library.-The library of Surgeon General's Office, known since 1922 as the Army Medical Library, has long been the largest medical library in the United States. Its growth as a great research facility dates from the post-Civil War period when Dr John Shaw Billings (q.v.) was placed in charge of it and surplus hospital funds were allotted by the surgeon general for its expansion. With the momentum thus provided, the library, whose collection, covering not only the field of medicine, but also various related sciences, has become so large and so well known that it often is referred to as the National Medical Library. It possesses over 1,000,000 items, including at least 500,000 bound volumes, and provides reference service not only to the armed services, but also to physicians, institutions, and libraries throughout the country.

The function of the library is to collect the medical literature of the world regardless of language, form, or date of publication. It possesses a great number of the earliest printed works, including over 500 incumabula, early manuscripts from European and Oriental sources, and a medical art collection containing approximately 12,000 items.

One of the most important recent developments in the history of the library is the growth of its photoduplication and microfilm service. This is operated for the benefit, not only of the Medical Department, but also of the medical pro-

fession at large

The Index-Catalogue of the library was formally established by Congressional Act of 1879 This publication, now in its fourth series (inaugurated in 1936), has become the "foundation for medical library service both here and abroad." Thus far 56 volumes have appeared Since September, 1945, the library also has been publishing the Current List of Medical Literature Inaugurated in 1941 by Atherton Seidell under the sponsorship of the Medical Library Association, this publication is issued weekly and is supplemented

by a monthly subject index

Inadequate appropriations and antiquated quarters (dating from 1887) have made it difficult for the Army Medical Library to provide completely satisfactory service. In 1943, a committee of civilian authorities on libraries recommended farreaching changes, including a complete recataloguing of the library's holdings. Since then, the recataloguing project has been inaugurated, the personnel has been virtually doubled, and steps have been taken to provide the staff with more men and women trained in library work. The urgent recommendation that a new building, to house the equally cramped Army Institute of Pathology as well as the library, be constructed, remains unfulfilled, but, to some small extent, the pressure on space has been lessened by the establishment of the lustory of medicine division in Cleveland in 1942, to which rare items were removed for greater security against possible enemy Another unit of the library is the historical division, which carries on the tradition of the Medical Department, established after the Civil War and continued after World War I, of preparing comprehensive accounts and evaluations of the department's experiences during major

HISTORICAL DIVISION, Army Medical Library.

MEDICAL ORGANIZATION, United States Navy. The Medical Department of the navy is administered by the Bureau of Medicine and Surgery which is one of the seven bureaus of the Navy Department. It is charged with and is responsible for maintaining the health of the navy through the promotion of physical fit-ness, the prevention and control of diseases and injuries, and the treatment and care of the sick The responsibility for coordinating and injured and integrating the administrative and professional functions of the Medical Department is vested in the surgeon general of the navy who is the chief of the Bureau of Medicine and Surgery. These functions are carried on by the personnel of the following corps which constitute the Medical Department: Medical Corps, Dental Corps, Medical Services Corps, Nurse Corps, Hospital Corps, and by the civilians in the bureau and in the field activities.

The maximum personnel allowed for each of the corps is prescribed by law as a percentage of the total officer and enlisted strength of the United States Navy and Marine Corps, but insufficient appropriations have in the past some-times prevented employing the total authorized officer strength . On the other hand, since World War II, the difficulty has been in finding enough

candidates to keep the Medical and Dental corps up to authorized strength The percentage allowances, with the corresponding actual numbers based thereon that were authorized for the fiscal year 1948, are as follows.

Corps	Allowance in percent- age of total officer and enlisted strength of the Navy and Marine Corps	Authorized strength in actual numbers for fiscal year 1948
Medical Corps Dental Corps	0 65% 0 2 %	3,092 952
Medical Services Corps Nurse Corps Hospital Corps	0 13% 0 6 % 3 5 %	618 2,854 14,910

Medical Corps.—Appointments to the Medical Corps are normally made either in the grade of assistant surgeon with the rank of lieutenant (1g), or in the grade of acting assistant surgeon, also with the rank of lieutenant (1g). In both cases such appointments are made after a competitive examination, which is held in June of each year Candidates must be between the ages of 21 and 32 In order to enter the examination for appointment as an assistant surgeon, the candidate must be a graduate of an accredited medical school and must have had an internship in a civilian hospital. For appointment as an acting assistant surgeon, the candidate must have completed the fourth or senior year in an accredited medical school, but is not required to have had an internship. Those who enter as acting assistant surgeons are assigned for one year to an internship at a naval hospital Should the intern at the end of the year desire to return to the practice of medicine in private life, his appointment as an acting assistant surgeon is terminated and he is honorably discharged from the naval service. If he desires to continue in the naval service, he must pass a further competitive examination.

The professional examination for assistant surgeons embraces the subjects of general medicine, general surgery, obstetric; and gynecology, preventive medicine, and medical jurisprudence. The professional examination for acting assistant surgeons covers only the subjects of general medicine and general surgery, in addition to an oral and practical examination. Each candidate must also pass a prescribed physical examination

Under certain circumstances to meet special needs of the navy, medical officers may be commissioned from the Naval Reserve or from civilian life in higher age groups and in higher ranks up to and including the rank of captain The same provision applies also to the Dental Corps.

The ranks in the Medical Corps are heutenant, junior grade; lieutenant; lieutenant commander; commander; captain; and rear admiral. Promotion is by selection made by a board of medical officers but, before being advanced in rank, the officer must also pass physical, mental, moral, and professional examinations

Dental Corps.—The requirements as to age, professional education, examinations, etc, appointment to the Dental Corps parallel those for the Medical Corps, although there is no requirement as to actual practical experience corresponding to the internship requirement for medical officer candidates. The same ranks are also provided, with the number of rear admirals limited to four, as the Dental Corps is numerically less than one third the size of the Medical Corps. Promotion is by selection.

Medical Services Corps.—This corps was established by an act of Congress in 1947 to fill needs brought to the front by the experience of World War II Modern wattare has become so highly scientific and technical that specialists m many fields besides medicine are needed to make it possible for the Medical Department of the navy to perform its functions satisfactorily. Some twenty specialties that are recognized as separate sciences will be represented in this Such a corps makes it possible also to provide careers for men that are highly competent to handle administrative and medical supply work, which formerly took up much of the time of medical officers to the detriment of their pro-fessional work. The act provides that the Medical Services Corps shall consist of a medical allied scientists section; a pharmacy, supply, and administration section; an optometry section, and such other sections as may be deemed necessary by the secretary of the navy

Members of the corps hold commissioned rank from ensign to captain. The initial recruitment of the corps was accomplished by transfer to the grade of ensign of temporary and reserve officers in the needed specialties who had served in World War II. Their rank was then adjusted with reference to the dates of their original appointments and the grades they had reached while in their former status. Subsequent appointments are being made in the grade of ensign, except that those holding doctorate degrees in sciences allied to medicine may be appointed as members of the medical allied science section with the rank of heutenant, junior

grade

Nurse Corps.—This corps has the same status as other staff corps of the navy. Its members hold commissioned rank from ensign to commander. The director holds the rank of captain and is selected from officers in the Nurse Corps of the rank of licutenant commander and

above.

A candidate for appointment to the Nurse Corps must be single, a citizen of the United States, and between 22 and 30 years of age. The candidate must have a broad general education, preferably a college degree, but must at least have graduated from an accredited high school that provides not less than a four-year academic course. She must be a registered nurse, and a graduate of a school of nursing, the educational and professional standards of which are ap-

proved by the surgeon general.

Hospital Corps.—This corps consists of chief warrant officers, warrant officers, chief petty officers, petty officers and nonrated men. They are designated below the grade of warrant officer as chief hospital corpsman (formerly pharmacist's mate); hospital corpsmen, first class, second class, and third class, hospital man; and hospital apprentice Commissioned officers of the newly created Medical Services Corps perform many of the administrative duties which were formerly performed by the higher levels of the Hospital Corps The Medical Services Corps is expected to recruit part of its personnel

by promotions and transfers from the Hospital Corps.

Members of the Hospital Corps perform a great variety of services and are an essential component of every combat force. The Hospital Corps may be termed the main working force of the Medical Department of the navy.

The nursing on all ships is, for example, performed exclusively by the Hospital Corps except on hospital ships where the nursing staff is supplemented by female nurses. The smaller naval vessels do not carry a doctor in the medical department (a doctor and a dentist may however be assigned to a group of small ships) but scarcely any commissioned slup is so small but what a hospital corpsman is included in the crew. The hospital corpsman may in an emergency be called on to perform any of the functins which are normally within the province of a medical officer. The incidents of hospital corpsmen who, during World War II, successfully performed appendectomies on members of the crews of submarines while on war patrols in the Pacific Ocean are cases in point

The lower ratings of the Hospital Corps spend much of their time studying and attending classes in connection with their training, and the upper ratings devote many hours teaching the lower ratings. This is necessary because there is no large calling in civilian life from which to recruit already trained hospital corpsmen.

Scope of Activities Medical and dental service and hospitalization are provided for all United States Navy and Marine Corps personnel whether on active duty or retired. With certain limitations, medical service and hospitalization are also provided for the dependents of such personnel. Emergency treatment is also given to the civilian employees of naval shore establishments.

The navy maintains some 30 naval hospitals, 120 dispensaries located in the continental United States, and 60 located overseas. A research laboratory, post graduate schools in medicine and dentistry, and refresher schools form part of the educational facilities provided to keep the Medical Department of the navy in the forefront of medical science.

The personnel assigned to the medical department of naval vessels depends on the size of the ship, that is, on the complement of the ship Battleships and large aircraft carriers have two medical officers and one dental officer, cruisers, one medical officer and one dental officer, smaller ships, a medical officer but no dental officer, and destroyers, a medical officer for each division. Personnel of the Hospital Corps in appropriate numbers and ratings constitute the main body of the Medical Department complement. As already mentioned there may be no commissioned officer in the medical department of a small ship but there is always a member of the Hospital Corps.

J. A. Furer, Rear Admiral, United States Navy (Retired).

MEDICAL PEDAGOGY. The theory of education in its application to medicine still is mostly traditional, like many of the subjects it includes, for the pedagogy of the great number of medical schools has no steady, carefully arranged and planned-for, fought-for, curriculum based on personal and educational psychology and knowledge of the modes in which a young (or old) person learns Both the method and the curriculum at present are largely traditional, like much of medicine in general.

When systematic laboratory work developed, largely in the richer medical schools, and recitations began to be systematically held, this preceptor-system—employing a practitioner to be guide, philosopher and friend, as well as tutor—

gradually disappeared, except as still maintained in or about all institutions of learning in some form or other. In this pedagogic respect, then, the medical school tends continually to imitate more and more successfully the didactic methods of the university, which, of course, are ancient.

"The requirements for admission to colleges holding membership in the Association of American Medical Colleges are 11 units of high school work and two years (60 semester hours) of

college work

THE HIGH SCHOOL REQUIREMENT

4	
(A) Required, 7 units Mathematics (minimum 2 years, maximum	Units
3 years), algebra and plane geometry.	2
English (minimum 2 years, maximum	4 2
One foreign language (minimum 2 years	
maximum 1 years)	. 2
History and civies	. 1
Total number of required units	. 7
(B) Elective, 7 units	
To be selected from the following English languing and literature (in addi-	
tion to the required work)	1 to 2
Foreign languages, additional, Latin, German, Italian, French, Spanish of Greek	
(not less than I year in any one)	1 to 4
Advanced mathematics, advanced algebra,	
solid geometry and frigonometry (1 year each)	1
Natural science, chemistry 1 year, physics	
1 year, and biology, botany, physiology and zoology (\frac{1}{2} to 1 year each).	1 to 2
Earth science, physical geography, geology	-
and agriculture (year to I year each)	ት to 1
Astronomy (\frac{1}{2} year) Drawing (\frac{1}{2} to 1 year)	i i to 1
History, ancient, medieval and modern,	
and English (I year each)	1 to 3
Manual training (1 year)	1
Bookkeeping (£ to 1 year)	₫ to 1
	C

One unit in any subject is the equivalent of work in that subject for four or live periods per week for a year of at least 36 weeks, periods to be not less than 45 minutes in length. One unit is equivalent to two semester credits or two points.

Premedical College Course.

SCHEDULE OF SUBJECTS OF THE TWO-YEAR PRE-MEDICAL COLLEGE COURSE.

Sixty Semester Hours' Required

	Semester
Required Subjects.	Hours
Chemistry (a)	. 12
The contract of the contract o	. 8
Physics (b)	
Biology (c)	
English composition and literature (d)	6
English composition and literature (d) Other nonscience subjects (e)	. 12
Subjects Strongly Urged.	6-12
French of German (1)	
Advanced botany or advanced zoology	3- 6 3- 6
Psychology	
Advanced mathematics, including algebra and	1
trigonometry	. 3–6
Additional programme of a programme to an	
Additional courses in chemistry	. 0-0
Other Suggested Electives:	
English (additional), economics, history, soci	
ology, political science, logic, mathematics	
	,
Latin, Greek, drawing.	

*A semester hour is the credit value of sixteen weeks' work consisting of one lecture or recriation period per week, each period to be not less than 50 minutes net, at least two hours of laboratory work to be considered as the equivalent of one lecture or recriation period.

Colleges may reduce the number of hours in any subject not more than 20 per cent, provided that the total number of hours in a division is not reduced. Where the teaching conditions in a college are best subserved, the subject may be, for teaching purposes, transferred from one division to another. When didactic and labora-

tory hours are specified in any subject, laboratory hours may be substituted for didactic hours.

Medical Education of Women.—The development of medical education for women in America gave back to the world the opportunity for feminine medical study which had been freely granted in the Middle Ages and then with so many other privileges was denied in modern times. The first woman student of medicine was Dr Elizabeth Blackwell, who, after being refused permission to study at most of the medical colleges in the country, finally secured the privilege at Geneva, N Y, when the faculty, feeling sure that her application would be rejected, put it before the students and they voted unanimously to admit her. She was graduated in 1849. Her sister Emily was refused two years later at Geneva, and Rush Medical College, Chicago, was censured by the State Medical Society for receiving her for a term. She was graduated at Western Reserve, Cleveland. The grant resolved to found reductions land The women resolved to found medical colleges of their own The first of these, the Women's Medical College of Pennsylvania, was founded in 1850. It had a quasi predecessor in the Gregory School of Medicine, established to train women as midwives, founded in Boston in 1848, and lasting until 1874. The Woman's College of the New York Infirmary was opened in 1805 and closed in 1899, when Cornell opened its medical course to women students. The Women's Medical College of Pennsylvania, was lounded in 1882, that of Cincinnati in 1886 and that of Kansas City in 1895

The University of California was a pioneer in opening its courses to women in 1869 and was followed in this policy by all the universities of Western States This development also included medicine so that the special need of medical colleges for women ceased in the West. When Johns Hopkins, Baltimore, opened its medical school in 1893 women were accorded the same privileges as men Gradually prejudices disappeared and other medical schools opened their doors to women, but it was not until the World War brought home the need for physicians during and after the war that Harvard and Columbia removed the restrictions against women in their medical schools In recent years medical schools in increasing numbers have

opened their classes to women.

Many medical schools need, and as much as anything else at all, except it be finances, an adequate survey by some wise and practical professional educator—one who would point out, for example, some of the inconsistencies and the lack of co-ordination between the different courses. «Visiting» committees frequently try to demonstrate to chance readers of their reports their own personal importance, but they seldom have any knowledge worth while concerning educational theory. An assistant or teaching fellow in almost any university department of education would be of more use in a really conscientious medical school than the wealthiest and most dignified of these committees.

The principles of pedagogic fatigue, of overwork, and of under-recreation are ignored in most medical schools, with a consequent great waste of mental energy. As has already been hinted, the medical student needs normal recreation as much as any other student, if not more. A course in the economics of learning should be given in the first semester of every medical

freshman year.

This suggests medical psychology in general. The everyday psychology of the emotions, for example, especially in relation to the functions of the body and its growth, should be studied and even understood by every medical man while yet a student. The present writer happens to be one of the carly ones to say this, namely in Science in July 1901 Medical psychology was offered year after year, the Tufts College 1901–02 catalogue-announcement of this pioneer course being as follows "Normal medical psychology—An optional course in normal medical psychology will be given to the fourth-year class in weekly lectures during the first half-year. Its aim is to discuss in their more general relations certain topics of great practical importance to the medical practitioner: such topics for example as suggestability and hypnosis, temperament, mood, the numerous habits, sexual mental differences, will-power, the emotions, pain and pleasure. Knowledge of subjects such as these prepares the student better to understand his patient as an individual and so better to treat his disease. But, in addition to this, the chief value perhaps of such information, the lectures will afford a brief basis of general psychology, which will tend to make the mental phenomena of the diseases of the mind and nervous system more easily understood» (Professor Dearboin).

In nearly a score of years the curiously inherent materialism of the medical schools has begun to soften, without a doubt, and to-day some of the very best medical colleges realize practically that education, any kind of education, that has ignored the study of mind and motive and behavior is incomplete and false in quite the most fundamental kind of way. This common lack of adequate psychology, however, seems still to be the chief pedagogical defect of medical education—man is both mind and body Nevertheless American medical education still

remains the best in the world.

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MEDICAL REGIMENT. See Ambu-Lance Companies; Hospitals, Military, Medical Organization in the United States Army.

MEDICAL SCIENCE AND THE WORLD WAR. Army medical departments everywhere had, before the war, prepared for the treatment of surgically clean wounds made by modern fire-arms in distance engagements. The soldiers' «First Aid» kit, with its sterilized dressings scaled from contamination, was expected to maintain this freedom of wounds from infection almost without exception Aseptic wounds assure prompt and uncomplicated recovery. Serious injuries of important organs would still often be fatal, but all others, as a rule, would be followed by convalescence without delay or complication. These anticipations were sadly disappointed by the immediate recourse to trench warfare as almost the sole mode of conflict. In trenches recently dug in fields which had been under cultivation for hundreds of years, bacteria abounded and infec-tions inevitably occurred Two extremely fatal forms of infection, tetanus and gas gangrene, raged among the troops Both of these were often fatal and the gas bacillus caused long illness and often extensive mutilation, even when recovery took place. Tetanus, after the early sad war experience, was prevented by

injections of anti-tetanus serum as soon as the wounded came under observation, the injections being repeated at regular intervals if convalescence from the wound was prolonged, for it was found that delayed infections occurred. The gas bacillus proved a much more difficult problem because of the utter unfamiliarity with it at first. It was unknown in Great Britain before the war, was not seen during our Civil War, and is very rare in civil life. Some 70 per cent of the wounds received in the tienches during the first year of the war were infected by it. It was never noted in wounds of the face or neck where the blood supply is abundant and the tissues well oxygenated, for the bacillus of it, discovered by Welch at Johns Hopkins, like the tetanus bacillus, is anerobic, that is, grows best out of the presence of the an. The successful methods of freatment included thorough opening up of wounds, the use of hydrogen peroxide, so as to provide additional oxygen for the tissues, and after careful investigation, the use of serums for curative and prophylactic purposes, elaborated by various agencies.

The noteworthy difference between the healing of the wounds of soldiers and those of salors (who were often exposed to cold sea water after the reception of their wounds) led to an important development in the treatment of large shell wounds and penetrating wounds of various kinds. The influence of salt water as a dressing for the surface of large wounds was carefully studied, and subsequently proved beneficial in

many cases.

The important development in the treatment of wounds came when Dr. Alexis Carrel of the Rockefeller Institute was put in charge of a French hospital in Compregue during the second year of the war. He set about the practical application of Lister's principles. Ordinary surgical antiseptics were too poisonous to be used for the flushing out of large wounds. A solution of hypochlorites proved to be bactericidal, yet non-toxic and non-corrosive to tissues. After experiment, Dakin's fluid, so called from the inventor of it who had been the director of the Herter Chemical Institute, New York, was found the most efficient solution of the hypo-chlorites. The important part of this treatment was the bacteriological control. After removal of all foreign particles and all injured tissues, wounds were thoroughly flushed with Dakm's fluid many times a day, until it was found by careful microscopic examination that the secretions contained very few bacteria and none to be feared. The wound was then closed up and permitted to heal without further interference. The results were excellent. Healing took place rapidly as a rule, convalescence was brief and absorption of septic material so as to produce constitutional disturbance rare and without danger. The after result was better than that produced by any other method and the hospitals where it was employed took on a new aspect from that which had been seen in the war hospitals before.

The most important development of the surgical treatment of war wounds has been what is called by the French dibridement, that is the thorough excision of all injured portions of tissue. The extent to which this clearing out of the wound was carried in war practice would have seemed utterly unjustified in civil surgery before the war. Where a penetrating bullet wound shows signs of infection, a cylindrical

portion of the tissue around it is removed. In larger shell wounds, a layer of injured tissue is. as far as possible, removed from every portion of the wound so as to present perfectly fresh vital surfaces for healing purposes. Large amounts of fissue are thus often removed, for experience has shown that it is in the end ever so much better for the patient. Any injured cells allowed to remain are of low resistive vitality, have a tendency to die and then break down into material which forms an excellent culture medium for microbes Where drainage is instituted, most of this will come away, but that is a much slower process and much more exhausting to the patient, and lowers the healing qualities of the part. It has been found by actual bacteriological observations that while very few bacteria are present shortly after the wound is infected, these multiply rapidly in the brood chamber created for them in the tissues, on the good medium for growth, while the healthy cells are handrcapped by the presence of injured cells in their struggle against

The war's experience with head injuries developed a mode of treatment quite different from that in common use before. The surprise for military surgeons was the wonderful tolerance of the brain to injuries. It was not an unusual thing to have wounded soldiers come into diessing stations as "walking cases," who were suffering from fracture of the skull, even complicated by other injuries. The best even complicated by other injuries surgery for these cases proved the greatest possible limitation of intervention. Depressed bone fractures must, of course, he lifted, but missiles should not be searched for. There is least danger for the patient when the missile is left in situ, unless symptoms directly traceable to its presence develop. As a rule, antiseptic rather than a eptic precautions are most valuable in saying lives in these cases. The experience of four years seems to indicate that the after effects of the retention of foreign bodies within the skull does not justify manipulations in reaching them.

The use of poison gas gave rise to the most unsatisfactory medical feature of the war. In spite of the German signature to The Hague Convention article condemning the use of gas, the Germans proceeded to employ this mode of attack and found the Allies and the medical departments unprepared for it. At first heavy gases containing mainly bromine were used, favoring winds carrying them Later gas hand grenades were employed. These gases had an intensely irritant effect and produced suffocation or were followed by severe purulent bron-chitis Pulmonary edema often proved fatal Gas masks overcame this mode of attack. Then long range gas shells were employed, sometimes with delayed action, so as to lull against precautions At times, shells containing "sneezing" or "vomiting" gases were used for the displacement of masks. In July 1917, at Ypres, "mustard gas," now known to be chemically dichlordiethylsulphid, was employed. It was persistent and would hang about for hours and make dugouts perilous for days. It burned the skin, and clothes moistened with it produced escharotic effects. Many of the most important German advances were made by means of these gases as a preliminary. The Allies learned to neutralize and reply effectively to all of them.

When the gas was not concentrated enough to produce suffocation or set up fatal pulmonary edema, the men usually recovered, though many of them went through a period of awful discomfort which was, of course, the reason why the use of gas was forbidden at The Hague. Comparatively few of those who survived presented serious lung lesions, though they had to be treated by the open air method, as for tuberculosis, as much as possible. We have learned from tuberculosis how tolerant the lungs are of even severe pathological conditions and how readily, after a time, compensation is secured The question whether gasing predisposes to tuberculosis has been settled in the negative, though undoubtedly in certain cases latent foci of tuberculosis were made active by the process

Comparative mortalities from wounds and disease in modern war show what a great gain was made by surgery and sanitary science in the war. In the Russian campaign against Turkey in 1828, some 80,000 died of disease and about 20,000 of wounds. In General Scott's campaign in Mexico the deaths from disease were over 33 per cent of the effective strength. In the Crimean War, out of a total force of 300,900, the French lost by disease 75,000 and by wounds 20,000. In the Prussian war against Austria, of but seven week's duration, the losses by disease were 6,427 and by wounds 4,450 in an army of 437,000. In the Spanish-American War 2,565 deaths were from disease and 345 deaths from wounds, in an army of 274,-717. In the South African War the deaths from disease were 69 per thousand strength; from wounds, 42 per thousand. In the Russo-Japanese War the deaths from disease were 418 per thousand strength and from wounds 72.9 per thousand strength, the ratio for the first time reversed. Out of 300,000 dead in the Civil War, in the armies of the North over 200,000 were from disease. In the Confederate armies, of 200,000 deaths, three-fourths were estimated as due to disease and one-fourth to the casualties. (Figures furnished by the United States Surgeon-General's Office).

According to the 'Medical and Surgical History of the Rebellion' (Medical volume, part 1, pages xxv and xxvi), there were in the Northern armies altogether 235,583 gunshot wounds with a resulting mortality of 33,653 or 14.2 per cent. These figures represent the total returns from about nine-tenths of the mean strength of the Union army and exclusive of the injuries of those killed in action. In the World War, the deaths from wounds, that is of all those who came to the surgeons alive, no matter how badly wounded, were less than 5 per cent. In view of the large numbers of poison gas casualties, the proportion of fatal cases was very low, being no more than about 3 per cent. This of course does not include the permanently blind. The serious infections with tetanus and the gas bacillus at the beginning of the war make the available statistics much worse than would otherwise be the case. With the control of these the mortality among the wounded in the closing phase of the war was probably below 3 per cent.

The health of army camps at the beginning of the war was most satisfactory. As Doc-

tors Vaughan and Palmer said in their article on "Communicable Diseases in the National Guard and National Aimy of the United States" (Journal of Laboratory and Clinical Medicine, August 1918), "Preventive medicine has made it possible to prevent half a million cases of disease and save the lives of ten thousand soldiers," and they give the figures from the Civil War and the World War for corresponding six months to show the truth of this The improvement has affected every form of infectious disease. There has been only about one-tenth as much mouth and throat inflammation, less than one twenty-fifth as much intestinal trouble, not one-hundredth as much fever. Malaria, which even in the Northern aimy was extremely common, has now become a negligible morbidity factor and the mortality from tuberculosis and pneumonia is more than cut in two. The sad epidemic of influenza proved that

it was not the general hygienic conditions that brought improvement but the specific sanitary precautions against particular diseases Unprepared for influenza in this virulent form, it raged very seriously, while the well-known camp diseases were kept entirely under control

Typhoid or enteric fever which has played such a fatal part in all previous wars, carrying off in the Spanish-American War more than five times as many as the bullets of the enemy and in the Boer War causing ever so much more havoc among the British than the Boers did, had almost no place in the late war. The reason was better sanitation and careful provision of uncontaminated water with the guarding of latrines from flies and other insects that might find their way afterward to food, but above all, the typhoid immunity of the armies was due to typhoid vaccination, that is the inoculation of the soldiers with cultures of typhoid germs prepared under conditions that produced immunizing results. There is no doubt at all that this is the genuine source of the great saving of life that was effected. The inoculations cause almost no disturbance of the general health, - soldiers have gone into battle the same day,—and only rarely have any serious effect. It is evident that in civil life travelers in distant countries or to parts of the country of whose sanitation they are not sure, will take such vaccinations against typhoid as a protective.

Trench fever was an affection peculiar to the great war and replacing typhoid fever somewhat in its ravages among the soldiers. The men came down rather suddenly with a considerable degree of temperature lasting for from three to seven days, gradually disappearing and causing a great deal of prostration. After some days of normal or sub-normal temperature, the fever occurs again and the relapsing character of the affection has been quite marked. Careful investigation has shown that the disease was distributed through the body lice which proved such a pest to the soldiers under the very difficult conditions as regards cleanliness to which they were subjected. The discovery made possible the prevention of the spread of the disease to a great extent, while the segregation of the relapsing and chronic cases in camps by themselves under favorable conditions of health brought about off the disease. The study of trench fever, its

etiology and its successful treatment as well as prevention, was one of the triumphs of the war

The great medical surprise of the war was the development of a large number of cases of a very severe form of functional nervous disease. Men lost control of themselves completely, sery often had disturbances of the special senses,—dealness was rather common, blindness not so frequent,—and sensory disturbances of other kinds, with mutism and tremor or paralyses of various kinds, were noted At first a great many of the cases were set down as forms of insanity and the patients were sent to insane asylums, but after careful study the purely neurotic character of the af-fection was determined. The cases were called "shell shock" and unfortunately, early in the war were grouped under this term, besides the neurotic cases, a number of latent injunes to the central nervous system, as from actual wounds by minute particles of shells at high velocity, severe concussions and the like It was thought for a time that the intense compression of the air with immediate release near an exploding shell caused an at high pressure to be given off from the blood, leading to rupture of capillary arteries of the central system or other definite physical lesions resembling those of caisson disease. The prompt and complete recovery of many serious cases under proper treatment contradicted this theory and made it clear that there must be no organic basis. The term shell shock was suggestive of something much more than a psycho-neurosis, which the affection really was, and the term nervousness, the word sick of wounded in parentheses being added to the diagnosis "according to the external conditions to which the man was exposed at the time of breakdown," was suggested for it. This would have been a much better term but the original name maintained itself, as so often happens. The condition was entirely due to an emotional storm with loss of control over nerves, and nothing else. Its importance will be readily appreciated from the fact that during the first half of the war, oneseventh of all the discharges from the British army, or one-third of the discharges if those from wounds were not included, were for "shell shock." It was four times as prevalent among officers as among men. Cowardice was excluded as the basis and there was no malngering, except in cases readily recognizable. The study of the affection has thrown great light on the psycho-neuroses of civil life and above all has been valuable in the matter of treatment.

These patients need special treatment in special hospitals. In ordinary military hospitals, surrounded by sufferers from actual physical conditions, they are the subject of unfavorable suggestion and little incentive to get well. They must not be kept under circumstances, either at home or in hospital, where much sympathy is afforded them and their stories must not be listened to sympathetically, for they have the tendency of all neurotics to assimilate as their own, experiences gleaned from various sources. The first requisite of successful treatment is a careful examination which determines absolutely that no organic morbid condition is present. Then the patient must be given the feeling that his case is of no special signifi-

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cance, but, on the contrary, is well understood and above all, has nothing exceptional in it He must be made to understand that just as soon as the attending physician has the time to give to him, he will be able to remove his symptoms without delay. Three principles are insisted on in the methods of treatment (1) suggestion, (2) re-education, (3) discipline. The aim of suggestion is to make the patient believe firmly that he will be cured and then after treatment that he is cured to stay so. Re-education overcomes the had habit of lack of confidence that has been formed and discipline breaks down the psychic-resistance of the patient to the idea of recovery. For such symptoms as mutism or deafness, the patient is told that electricity will cure him and that as soon as he feels the current when the electrode is applied, his power of speech or hearing will be restored part passu, with sensation. The same method is used for blindness and other sensory symptoms Paralyses are favorably affected the same way, though tremors are harder to deal with A cure in a single treatment is the best method, for the patient readily relapses unless he has been made to feel that he has recovered his powers completely and that it would be his own fault to permit his symptoms to recur. The cases partake of the nature of hysteria, though typical hysterical symptoms, crying, the making of curious noises, hysterical convulsions, are raiely seen at the front. The experience has made it clear that rest is nearly always an abuse in the treatment of such cases and inveterates the symptoms. The physical condition must be improved but the state of mind must be changed completely at once, if cure is to be effected.

A very interesting development of the treatment of these affections among the French, who had large experience, requiring over 20,000 places in their hospitals for the cases, was with regard to the value of severe discipline. In 1efractory cases, patients were put in solitary confinement without reading or writing matenals or tobacco. This changed the mental attitude and helped to make counter-suggestion effective. In certain cases, strong Faradic currents were used which caused severe pain, so that patients who were mute had to scream out and those who could not use muscles were com-pelled to move them. Once it became known that treatment of this kind was being used, symptoms were much less persistent. The reason why the neuroses in officers were more dif-ficult of treatment was that these measures were seldom employed on them. It became clear that the infliction of pain on a neurotic patient up to the point where he yields up his pathological suggestion is effective therapeutics. Some older severe methods of dealing with these cases which were condemned in our milder day are now justified by war discipline.

The surgical feature for which the late war was noted is the definite reconstruction work for the wounded which was organized for the first time in history. Not only artificial limbs and helpful apparatus of various kinds were provided, but the crippled were trained to do the work they are particularly suited for in their maimed condition. It was found that some 95 per cent of those who lost an arm or hand could go back to their old occupations, while a very large proportion of those who lost a leg could

be trained to bench trades or given clerical or similar occupations which made them thoroughly independent of assistance Even with the loss of both legs, a man can be self-supporting. Indeed, the care exercised in training the crippled tesulted in a great many cases in giving them a better occupation in life than they had before. The temper of this aid has been such as to give men a hearty spirit of courage in facing life, so that they do not feel their handicap as an incubus, but on the contrary, are ready to do their bit in civil life as well as they did in man. The idea there? in war. The idea that they are crippled is not allowed to overcome them and the old custom of having begging cripples after the war is not to be allowed. Even the blind and the deaf are made self-supporting and at the same time given such occupation of mind as keeps them from being depressed. The effect of example on the part of some of the more courageous proved a wonderful stimulus, so that though the war left many maimed men, it did not tend to create many helpless and the spirit of helpfulness does not provide useless sympathy and paralyzing charity, but just such encouragement as enables the men to help themselves.

Chronic affections of various kinds which developed as a consequence of the war were treated by the same far-seeing after-treatment that was given to the maimed In a word, the soldier taken in health was either dismissed, after thorough examination, in as good health as before,—or usually much better,—or else he was given the advantage of scientific thoughtfulness and pre-vision in regard to his case, so as to restore him just as far as possible to his former usefulness as a member of the community. In the years following the war these phases of rehabilitation received the closest attention from medical authorities in the former belligerent countries.

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MEDICI, měď'e-chē or mã'dē-chē, a Florentine family who rose to wealth through commerce, became prominent in the affairs of the state, gained supreme power and were in general known as patrons of literature and art. Grovanni (1360-1429) rendered important service to Florence and became gonfalonier in 1421. His son, Cosmo, the Elder (1389-1464), was called "Pater Patriæ," gained vast wealth, was a munificent patron of art and letters and combined statecraft with commercial enterprise. He was for 34 years the sole arbitrator of the republic and the adviser of the sovereign houses

His grandson, LORENZO THE MAG-NIFICENT (1449-92) governed the state in conjunction with his brother Giuliano (1453-78) till the latter was assassinated by the Pazzi, a rival Florentine family Escaping from this massacre he conducted a war with Ferdinand of Naples, with whom he signed a definitive peace in 1480. The rest of Lorenzo's reign was passed in peace and in those acts of profuse liberality and magnificent patronage of arts and sciences, in which he rivaled or excelled his grandfather. He left three sons—Pittro (1471-1503), Giovanni (afterward Pope Leo X), and Giuliano, Duke of Nemours Pietro succeeded his father, but was deprived of his estates when the French invaded Italy in 1494 He fisched his carper in the service of France finished his career in the service of France. His eldest son Lorenzo came to power by the abdication of his uncle Giuliano, who became Duke of Urbino. He died in 1519, leaving a daughter the first Collins of the first Collins of the first collins daughter, the famous Catharine de' Medici (qv), queen of France After several reverses in the family, Alessandro, an illegitimate son of the last-named Lorenzo, was restored to Florence by the troops of Charles V, and by an imperial decree was declared head of the republic, and afterward Duke of Florence. The next name of importance in the family is that of Cosmo "the Great" (1519-74), in 1537 proclaimed Duke of Florence and afterward Grand Duke of Tuscany A learned man himself, he was a great patron of learning and ait, a collector of paintings and antiquities Francisco Maria I, his son, obtained from the Emperor Maximilian II, whose daughter Joanna he had married, the confirmation of his title of grand duke in 1575, which continued in his family until it became extinct in 1737 on the death of Giovanni Gasto, who was succeeded death of Glovanni Gasto, who was succeeded by Francis, Duke of Lorraine. Marie de Médicis (q v.) (1573-1642), queen of France, was daughter of Francisco I See Florence; ITALY—HISTORY; LEO X, and consult Armstrong, Edward, 'Lorenzo de' Medici' (London 1896); 'Cambridge Modern History' (Vols I and II, New York 1903-04); Fabroni, Angelo, 'Magni Cosmi Medicei Vita' (Pisa 1789); Heyek Eduard (Die Medicer) (Biolafid 'Magni Cosmi Medicei Vita' (Pisa 1789);
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MEDICI, Banks of the. The opulent house of Medici owed its origin, like that of the scarcely less wealthy house of Fuggers (q.v), to the profits of the woolens trade, the progenitors of both houses having been weavers and dyers of woolen cloths, in their time the principal constituent of European garments; the cultivation of cotton and manufacture of cotton cloths being as yet monopolized by the Saracens Schoenhof informs us that in 1422 Florence (under the Medici) had more than 70 banks, which by the year 1472 were merged or consolidated into 33. So important were these institutions to the Florentine republic, that they earned the sobriquet of the "Fifth Es-

tate" The Medici had 16 banking houses in different European cities (Journal American Bankers Association, September 1916). In the 15th century one of the Medicis was appointed treasures to the Papal See, in the 16th century one of the Fuggers held the same high office It is an interesting circumstance that the former became a Platonist, while the latter joined the Reformation Lorenzo de Medici's appointment as treasurer was made by Sixtus IV in 1471, Huldric Fugger's, by Paul III about 1549. Both of these popes afterward assailed their appointees; but the banks they controlled and the important trades they financed rendered them too powerful to be easily overthrown The Medicean banks received deposits of money for safekeeping, loaned the same out upon collateral, discounted commercial paper, issued bills of exchange, and traded in foreign cons and bullion. They possessed mints in Florence, Urbino, Barile, Pezza and other places, in which they struck then own coms, the series beginning in 1204, upon the fall of the Greek Empire, the dates in the old calendar being 10 years earlier. These comages enabled the Medicean banks to make highly profitable exchanges of old coms and bullion at the various emporia in Europe and Asia which were brought within the circle of their commercial influence Their earliest gold coin (the Florin) was struck in 1252, the series being issued by the gonfalionere (Standard-bearers) of the Republic of Florence until 1533, when they were struck by the Medici as dukes of Florence, afterward as dukes of Etiuria Maintained at their full legal weight (56 English grains, fine gold) the florins continued to be current in all the ports of Europe for centuries, their only rivals being the seguns or ducats of Venice For the history of other ancient banks See BARCELONA, BANK OF; BYZANTIUM, BANK OF; FUGGERS. BANK OF THE; GENOA, BANK OF; TYRE, BANK OF; VENICE, BANK OF.

MEDICINE, American Academy of. See American Academy of Medicine

MEDICINE, Eclectic, embodies the principles and practice of the only established American school of medicine. The term Eclectic was not the most fortunate, for at no time has it adequately defined the school's posi-When chosen, the term was very popular and was borne by several education systems and books, and was moreover well known to the laity. The name American School of Medcine, as proposed by Dr. A II. Baldridge, one of its pioneers, would have been more expressive, would have avoided misunderstandings and would have saved the school much criticism regarding its position among the existing systems of medicine. Eelecticism is the direct successor of the American Reformed System of Medicine originated by Dr. Wooster Beach of New York City in 1825. It should not be con-founded with Thomsonism (Thomsonianism), or the doctrines of the steam and herb doctors, promulgated and practised in the early part of the 19th century by Samuel Thomson of New Hampshire, the peculiar theories of which the Eclectic school never adopted; the majority of the followers of Thomson being among their most bitter antagonists. In later years, however, many of the Thomsonians joined the Eclectic school and creditably assisted in up-

building it. The most successful organizer of the Eclectic school was 1)r Thomas Vaughan Morrow of Kentucky The investigations in medical botany and materia medica by Schoepf, Benjamin Smith Baiton, W. C. P. Barton, Constantine Rafinesque, William Tully and others gave an impetus to the movement which resulted in the establishment of the new school The Reformed School of Medicine, by which name what was later denominated Eclecticism was first known, was organized in opposition to the drastic practice of the dominant school of medicine, bleeding, blistering, and the abuse of the salts of mercury and antimony, - against which Eclectics, as well as the followers of Thomson and Hahnemann, protested Instead of these barbarous remedies the reformer sought to substitute milder measures and to employ vegetable medicines whenever possible Yet, in the light of the present the substituted practice of the early reformers would be regarded as but little less barbaric than that which they sought to supplant. The basis of Eclectic philosophy was the sustenance of the vital forces, the avoidance of depleting remedies, and the selection, as with the ancient Eclectics, of the best of remedies and means from all sources, even despising not the primitive medicines of the untutored American Indians They did not test contented, however, with merely "selecting the best"; they endeavored to improve on such selections. To the reformer the practice of the dominant school was cruel and inhuman, the remedies barbaric. Out of the common stock of remedies he chose those best suited to his purpose in what he believed to be a more humane practice. He looked forward to certain ideals and objects not in accord with the views and practice of the dominant school For his presumption in thus opposing the authorities in medicine and by inaugurating unwelcome innovations he was branded an irregular; was ostracised by the self-styled regular physicians. An outcast, he was thus forced to organize a school in accord with his theories and practice.

There are three epochs in the history of Eclectic medicine,—the period of reformed medicine, from 1825 to 1845; the formative period, from 1845 to 1869, which was largely concerned in organization, and study of plant remedies; and the period of specific medication, from 1869 to the present, in which the best work of the school has been accomplished, and during which the theory of specific medication was promulgated and has been most largely practised

The educational history of Eclecticism dates from 1825, when Dr. Beach privately instructed students at his clinic in New York, where, in 1827, he established an Infirmary, which in 1829, he expanded into the Reformed Medical Academy. In 1830 it assumed the more dignified title of the Reformed Medical College of the City of New York. It was well equipped and continued in operation until about 1838. Textbooks of a high order were prepared by Dr Beach. A national society was formed and from this body an expansion movement was begun by the selection, in 1830, of Dr John J. Steele as an agent to proceed westward and explore the towns on the Ohio River with a view to selecting an cligible site for a branch of the New York College. A circular of the

society having reached Worthington, Ohio, Col. James Kilbourne, president of Worthington College, invited the promoters to establish their school in that town Dr Steele accepted and Dis Thomas Vaughan Morrow and Ichabod Gibson Jones were sent to perfect the organiza-The Reformed Medical Department of Worthington College, as this school was called, entered upon a successful career in 1830, with Dr. Morrow as the leading spirit, but lack of proper facilities, the machinations of enemies, internal dissensions, and the financial crists of 1837 caused it to be suspended in 1842 Dr. Morrow next removed to Cincinnati, Ohio, and assisted by Drs. Lorenzo Elbridge Jones and Alexander Holmes Baldridge, at once organized the Reformed Medical School of Cincinnati. In 1845 this college was chartered by the State of Ohio as the Eclectic Medical Institute. From this time the term Eclectic has been employed to designate the system and its physicians.

The formative period of Eclecticism began with the chartering of the Eclectic Medical Institute in 1845 and ended with the introduction of specific medication in 1869. During this period large classes attended the Institute. The Western Medical Reformer, begun in Worthington in 1836 and suspended in 1838, was now revived and published as the *Eclectic Medical Journal*. Barring a brief half year suspension this periodical has continued to be published to the present time. In this period, Dr John King, justly styled the father of modern materia medica, began the publication of his numerous textbooks, among which the 'American Dispensatory) gave the school an enduring and monu-mental work on materia medica The pharmacy of the school advanced from crude drugs in powder, infusion and decoction past the resinoid and alkaloid distraction to improved galenicals. In this connection be it recorded that Professor King discovered and introduced the resins of podophyllum and macrotys, which together with the alkaloids of hydrastis and sanguinaria, were afterward prepared by Dr. William Stanley Merrell. These valuable agents together with the olcoresins of iris and capsicum attracted the attention of pharmacists. A host of indefinite compounds was added by others and the market was flooded with what purported to be Eclectic resinoids or concentrations. This heterogeneous class of pharmacals was denounced by Professor King and others who had sought to introduce only elegant and definite compounds. This much abused class of resinoids served, however, a temporarily useful purpose in the evolution of a more perfect materia medica. Of these preparations, only those made after the methods of Dr. King, and the alkaloids of hydrastis and sanguinaria have survived and singularly are now mostly employed by practitioners of the dominant school. During this period Eclectic colleges were established at Rochester and Syracuse, Louisville, Philadelphia, New York and Cincinnati. The majority of these were short lived and some of them had a strong leaning toward the system of botanic medicine now represented by the physio-medicalist. The Eclectic Medical College of Pennsylvania for many years in good repute, finally drifted away and during the later years (since 1871) was neither recognized by Eclecticism nor others. In 1856, a portion of the faculty of the Eclectic Medical Institute formed a rival college in Cincinnati which had a large following. This school was absorbed by the Institute in 1859. The Civil War seriously threatened the educational progress of the cause and the withdrawal of a large quota of Southern students caused a marked shiinkage in the attendance at the Northern schools Times were hard and the outlook gloomy Dr John Milton Scudder, a graduate of the Eclectic Medical Institute in 1856, now became the head of that institution By strict business management he maugurated a period of renaissance and Eclecticism soon became a recognized force in medicine in America. Specific medication, introduced by Dr. John M. Scudder in 1869, though at first vigorously opposed, is at present the basis of practice of fully three-fourths of the Eclectic physicians and is the leading therapeutic doctrine taught in all the Eclectic colleges In fact modern Eclecticism is the practice of specific medication. Its theory is as follows.—Disease is a wrong or impairment of life. It is manifested clinically by certain well-defined symptoms The totality of symptoms express a condition, to which, in the usual nosological classification, a special name is given disease name is of value only in the study of the natural history of diseases, for statistical data, for the purpose of recognizing contagious and infectious diseases, and for establishing a prognosis, certain necessarily fatal diseases allowing only of palliative treatment. The specific medicationist, like practitioners of other schools, pursues such a method of nosological diagnosis for the purposes named, but not as a guide to treatment, in which to him it is of little or no value. For therapeutic purposes he reverses this process and studies his case by analysis, not by synthesis, to discover, if possible, the varying conditions which make up the disease, as evidenced by specific and well-defined symptoms revealing disease expressions Remedies have a certain force, and are definite in action. Like effects follow like causes Hence, having found, by repeated experimentation, the opposing action of a drug in a certain condition of disease, as expressed by certain specific symptoms, objective or subjective, the same remedy will always relieve or cure like abnormal conditions. The believer in specific medication holds that there is a fixed relationship between drug force and disease expression

The Eclectic has no specifics for diseases but specific remedies for specific conditions of such diseases. Specific diagnosis implies diagnosis to discover the condition curable by a certain remedy, as established by previous experimentation, and specific medication means the application of the known remedy for the pathological condition so found. Specific diagnosis is therapeutic, not nosological diagnosis. In practice the specific medicationist is guided in the selection of his remedy by "specific indications," as illustrated by the few following examples: The strong, excited, bounding pulse indicates veratrum viride; sharp, cutting or lancinating pain in serous tissues, bryonia; the full, oppressed pulse with a sensation of præcordial fulness and dyspnæa, lobelia; marked periodicity, with moist tongue, open pulse and freedom from nervous excitement, quinine; cadaverous odor of the secretions, potassium chlorate, etc.

The modern Eclectic recognizes no law of

rure, and does not accept a remedy as a specific

until the extended successful employment of it in some particular condition has given it the right to be so called Empiricism and experimentation are the foundations of knowledge concerning each remedy denominated a specific medicine. The havor wrought Eelectic pharmacy at the close of the formative period had now to be remedied. The school had been nearly shipwrecked on the shoals of commercial selfishness, as seen in the instance of the resinoids Calamities often bring about future good so in this instance the commercial mistakes of a few gave a renewed impetus to better the conditions of Eclectic pharmacy Uncertain preparations were supplanted by definite medicines. As a result the school has now a materia medica and system of therapeutics much sought by the descendants of those who endeavoied to block the efforts of the proneer Eelectic, in his zealous contention for pure and representative medi-cines Di Scudder, supported by Dr King and others, advocated office pharmacy as a step toward a better knowledge of drugs and to secure definite remedies. Special attention was given green and freshly dried products Formulas were published for the preparation of specific medicines. Finally, in order to secure the integrity of these medicines and protect them from conscienceless manufacturers, Dr. Scudder copyrighted the labels These bore the title "Specific Medicines" and gave the specific indications for their use. The manufacture of medicines bearing these labels was entrusted to competent pharmacists and from that time the school has been free from objectionable pharmacy. Dr Scudder advocated the use of specific medicines in the study of the relationship of medicine to disease expressions Eclectic of the formative period selected from other schools, but endeavoied to improve. He substituted milder for harsher methods; he opposed the use of the lancet and blister, and the abuse of mercury and autimony salts. The modern American Eclectic advocates the use of kindly curative remedies, and the avoidance of depressing or depletive medication. He has been the proneer in the study of the indigenous materia medica, with special reference to specific indications and specific uses of medicines employed. He contends for the best possible pharmacy so that the minimum amount of medicine may accomplish maximum results. Harmful medication as exemplified in excessive drugging he has consistently opposed, heroic over-drugging having been one of the most potent causes leading to the necessity for the establishment of an Eclectic school. He advocates liberality of thought, the highest medical education, the cultivation of professional dignity, and the ethics that govern gentlemen.

The position of the Eclectic school of medicine is now well established, and the attitude of malice and persecution formerly shown it by rival schools is fast becoming a memory. The two colleges had 253 Eclectic students in 1926. For a period of about 10 years this numerical relation has remained nearly stationary, but because of better facilities for teaching, enlarged literature, and harmony in the ranks of the school it has never occupied so favorable a position nor had a better outlook for the future than it has to-day. Never before in its history has it been so free from internecine bickerings. attacks by rival schools, and unpleasant entanglements and alliances. It challenges all ages in the wealth and completeness of its materia medica Recognizing the metit of the work accomplished the regular profession in many localities now invites beleeties to join its associations providing they drop their distinctive title. This the Eclectic is unwilling to do, believing that the school has carned the right to be regarded and recognized as a distinct set in medicine. Its work in the special fields of materia medica and specific diagnosis and specific medication entitle it to this right. The Eclectic school has a strong national organization and numerous State and local societies. A national reform association was founded in 1829, and a second at Worthington, Olno, in 1830. In 1848 the first National Eclectic Medical Association was organized in Circumati, Olno, with Dr. T. V. Morrow as president, and it held annual sessions until 1858 The present National Eclectic Medical Association was organized at Chicago, Ill, in 1870, with Dr. John W. Johnson, of Connecticut, as president. It holds annual sessions, meeting in various cities throughout the United States Eelectic practioners now hold positions as examiners in the more important hie insurance companies, and are not now debarred from the army and navy medical service as in the earlier days of medical ostracism. No discrimination is now made against them as surgeons for the great railway systems. These recognitions have been carned in the face of vigorous medical opposition, by the consistent and honorable course pursued by the Eclectic school as a whole The Eclectic Medical College of Cincinnati, Olio, the parent school of medical Eclecticism, and the Middlesex College of Medical College Medica of Medicine, Cambridge, Mass, are the leading colleges of this American system of medicine.

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Ohio.

MEDICINE, History of. As far as we can determine or surmise disease has existed since there was life on earth. There was a time when this earth consisted only of manimate matter. It is quite certain that death began almost simultaneously with the beginning of life. Disease in one form or another must have begun almost as soon. It may be that the earliest form of disease was metabolic, merely a manifestation of the wear and tear of the living organism. Soon perhaps, in addition to these changes associated with senescence, abnormal changes commenced to develop in certain subdivisions of living matter, changes which altered definitely the character of these subdivisions, and which were not the simple changes resultant on ageing.

It is characteristic of what we understand as life that the constituents which make it up are in a state of constant activity, the component elements breaking down and being replaced by additional elements derived from without. The process of building extraneous inanimate material into living tissue has come to be known as analyolism while the breaking down, or disintegration of the living structure has been called katabolism. The whole process, the simultaneous building up and breaking down constantly going on is termed metabolism.

Metabolism, the process of living, can continue only as long as there is available material

for repair and for growth, for reproduction and the other functions commonly identified with life. In remote periods, before life had been so far differentiated as to be recognizable in the forms which we now see, all nourishment, all materials for the anabolic processes were without doubt derived from inanimate, inorganic matter. With the progress of evolution, however, the time arrived when, with both living and dead matter surrounding a living structure, the latter developed a capacity for utilizing both the inorganic and the organic substances for its own purpose of living. And thus living matter, or living tissue, developed the capability of obtaining sustenance from other living organisms. This condition, one body living at the overcess of particles. body living at the expense of another living body, has been termed parasitism. And thus by degrees parasitic diseases have developed. In the animal and vegetable kingdoms parasitic disease takes many forms, the commonest being so called infectious disease.

Intectious disease or parasitic disease no doubt commenced early in the stages of evolution. Today the human body may be invaded by small microscopic living structures known as bacteria which derive their sustenance from and live at the expense of their host. The earliest forms of life were similar simply organized microscopic bodies. But even at an early stage it now appears probable that these so-called unicellular micro-organisms suffered from parasitic disease. Only within the past few years has experimental work suggested that bacteria which cause infectious disease in man, themselves suffer from parasitic disease, such that they may be destroyed entirely by some even more minute forms of living matter mul-

tiplying at their expense.

And so, long before man appeared upon the earth, living matter suffered from one form or another of most of the disease types known

As soon as man had developed sufficient intelligence to distinguish ageing from metabolic disease, from parasitic infection, in short the occurrence of a diseased state, to interpret and describe pain and the other symptoms characteristic of disease, and to wish to relieve himself or his neighbor of this abnormal state, the practice of medicine in its crudest form took its beginning.

Among the earliest savages, as indeed among the savages of today, disease was customarily looked upon as of supernatural origin, the work of an unfriendly demon or a form of punishment inflicted by an angry god Disease was ascribed to special demons of disease, the machinations of departed spirits or of ghosts, the activities of slam animals, to human enemies possessed of supernatural powers and the capability of casting spells, or to the wrath or vengeance of one of the tribal gods.

Attempts to rid the body of disease consisted therefore in making sacrifices calculated to propriitate the offended detry, or of doing penance for one's sins even to the point of actual personal torture, self inflicted or inflicted by others, or by seeking the intervention of other more friendly spiritual forces in behalf of the victim. If the disease resulted from invasion of the body by unfriendly demons, the proper treatment lay in making the body as unpleasant an abode as possible for the devils.

This was accomplished by starving, beating or otherwise tortuing the victim, by giving emetics to cause vomiting, etc. Again, the evil genii might at times be enticed from their new abode by the offering of a more pleasant dwelling. Thus the demon of yellow jaundice might be lured into the body of a canary bild.

And so we see the medicine man of the savages steeped in spiritualism, employing grotesque ritual in the treatment of his victims, oftentimes causing more serious harm than the ravages of the disease which he had been at-

tempting to cure

The belief in a supernatural origin for disease, arising in the savage's terror of the incomprehensible, persisted far into historical times and we see it still manifested in the mythology and theology of the Greeks and Romans. Indeed, even in the Christian religion, particularly in the early centuries of our era, we repeatedly observe evidence of belief in the origin of disease as an act of divine retribution coupled with the idea of relief therefrom through propitiation of the omispotent wiath

The earliest individual physician known in history was Sekhet'-enanch, an Egyptian who lived about 3000 B c. From a study of records in Egyptian tombs we learn of the existence even in his day of the lancet and of an instiu-The earliest operation ment for cupping. known is that of trephining of the skull, a procedure which even today is serious and difficult This was performed to provide portals of escape for demons such as the demon of headache We learn from the Ebers Papyrus, headache written about 1500 B. C, that pills, potions, in-unctions, inhalations and plasters were all used at that time. The value of the poppy for soothing crying infants was recognized. On the other hand, ignorance and superstition were still strongly active. Thus «against all kinds of witchcraft, a large beetle, cut off his head and wings, boil him, put him in oil and apply to the part. Then cook his head and wings, put them in serpent's fat, warm it, let the patient drink it »

Early advance in the knowledge and practice of medicine was slow and intermittent and our records thereof are most fragmentary. The ancient Hindus of India progressed to a degree truly remarkable for their epoch, both in their knowledge of medicine and particularly in the art of surgery. Most of our information of these ancients is derived from the Vedas or «Books of Wisdom,» the fourth of which, written around 700 B. C, gives us the major portion of our information. As early as this, new noses were created from cheek and forchead flaps, supraorbital nerves were sectioned for neuralgia, and laparotomy was discussed. In medicine also, remarkable strides were made, particularly in army sanitation, and the establishment of hospitals and of asylums for the blind and the

lame

True medicine had its origin in the early Greek civilization. The Greeks of three and four hundred years before Christ worshipped many gods and demigods A different god or goddess for every phase of their existence. Among these was Asklepios, (more commonly called by his Roman name, Aesculapius), the god of medicine. To the temples of Aesculapius went all who might, of those who were

diseased, there to regain if possible their former health. This was accomplished by prayer, by sacrifice or through other methods of imploring divine intervention. Customarily, while sleeping before the altar of Aesculapius one would receive in a dream the knowledge necessary to receive health.

The Greeks were primarily thinkers or pondeters. Their activities and writings express a natural stage in the evolution of the developing intellect, with its desire to know the why and wherefore of all things. With few or no in-struments with which to carry out accurate studies or investigations in any of the lines now known commonly as science, such as physics, mathematics, medicine, etc., they could but recognize the existence of certain phenomena, reflect upon them, reason as to their possible causes, and theorize as to their modes of action This was but to philosophize and the ancient Greeks became the greatest of all philosophers. They had developed the attributes of inquisitiveness and were scarching to know the why and the wherefore of all things with which they came into physical or mental contact.

It was at this time that the temples of Aesculapius had reached the pinnacle of their prominence and the priests and others associated with the work of the temples were searching to know more of the phenomena of disease.

What an opportunity for the study of disease, in these localities where the sick from the civilized world were aggregated! And what a paucity of instruments wherewith to make conclusive investigations! No stethoscope, no thermometer, no methods for exammation of the urine, no laboratory facilities whatsoever. Nothing beyond the five senses,—sight, hearing, taste, smell and touch, but reinforced with a truly remarkable insight and judgment and incusual interpretive faculties.

From past experience the priests soon recognized the types of illness with greatest promise of rehet through the intervention of Aesculapus and they selected only these from among the thousands seeking admittance into the temples. Consequently the percentage of cities was many times higher than had they allowed all to enter, and the fame of the temples spread. Likewise did their wealth increase for it was the custom, with health regained, to leave large votive offerings to the benign defty.

But as the reputation for healing spread, even more visited the temples and more were perforce turned away. Many of these, too ill to return or lacking sufficient funds, were obliged to remain in the neighborhood and were cared for by lay workers. These latter termed Asclepiadæ were not infrequently men of unusual brilliance. They, above all others, possessed a tremendous opportunity for the speculative study of the symptoms and course of

disease.

The temples of Aesculapius and the neighboring buildings where the less fortunate sick were attended became veritable huge sanatoria in which hygiene and hygienic principles were rigorously enforced. The importance of diet, of baths and of various forms of mental and physical recreation was fully recognized. The Asclepiadæ were as a rule on excellent terms with the priests in the temple and had no difficulty in following their cases whether they re-

mained under their care or passed on into the temple. The opportunity was enormous

The fortunes of the world were materially

advanced when in 100 B. C. Hippocrates, the son and grandson of physicians, was born. As one of the Asclepiade he was trained from early youth in the profession of medicine. One of the keenest observers of all time, Hippocrates was at the same time an able philosopher. He wrote prolifically and with such clear understanding of the symptoms of disease that in his writings and those of his pupils we recognize many of the diseases as they are diagnosed today. While the existence of various maladies was recognized long before the time of Hippociates, he in particular stressed the importance of differentiating disease entities by a study of their symptoms. The greatest Hippociatic contribution to medicine and that which above all others justly allows him the title of Father of Medicine was his successful attempt to divorce the phenomena of disease from su-perstition and the idea of supernatural forces He preached that disease is the result of natural causes which must be searched out and considered in a most critical spirit until all sources of error are chiminated as far as possible. Forfunately also he founded a school of medicine where the principles which he was evolving were put into practice. These were, (a) the objective investigation of disease, (b) the study of etiology or cause, and (c) an insistence upon the value of expectant treatment, combined with mild therapeutic measures

Pre-Hippocratic medicine, steeped in tradition and based to a great extent upon idolatry, had little foundation of fact upon which to build a rational system of treatment. How could one prescribe the proper remedy in any pathologic condition when practically nothing was known of the anatomy or physiology of the human body? One must have an understanding of the makeup and mechanism of the machinery which one is attempting to repair to keep it running smoothly. Before, and indeed through the Greek civilization, little was known of anatomy save those facts discovered by the priests in their dissections of sacrificial animals Even here the dissections were of a most super-ficial character. The organs of sacrificial animals were studied for good or evil omens. The liver, because of its size, was considered of unusual importance. From its examination the course of future events was predicted Among the Babylonians hepatoscopy was practiced as early as 3000 B C. If the gall bladder were found to be swollen on the right side, it indicated let us say, an increase in the strength of the king's aimy and was a favorable omen A long bile duct pointed to a long life even as a lengthy line in the palm of the hand today is considered by the superstitious as indicative of

longevity. Hippocrates upset the old tradition, divorced, in part at least, the practice of medicine from theological superstition and paved the way toward rational study of the human body. His writings and those of his followers were soon spread over much of the known world and became the standard for professional conduct. Hippocrates lived in the golden age of Pericles, the great epoch of ancient Greece Not long after his death the beacon of learning in Greece burned low, and the centre of civilization was

transferred to Alexandria in Egypt where Ptolemy, one of Alexander's generals, founded a great museum and centre of investigation and teaching He brought together minds of the times in the various branches of science and philosophy. Here, for the first time, extensive dissections of the human body were carried out and although the interpretations of the findings were more often erroneous than not, some progress was made toward a clearer understanding

of anatomy and physiology.

With the growth of the Roman Empire, we observe a new light shining forth in the history of medicine,—Galen, the greatest of the Roman physicians and the greatest physician since Hippocrates. He was born in 130 A D, of Greek parentage. He was a keen observer, an experimenter and at the same time a philosopher. He was the fashionable physician of his time and, it is interesting to note, collected good fees. It has been stated that he received the equivalent of \$2,000 for a fortnight's attendance upon the wife of a prominent Roman.

Galen's greatest contribution was in the study of anatomy and physiology. He had studied anatomy in Alexandria and was thereby well grounded. Most of his investigations were made on apes and pigs. His most valuable permanent contribution was in osteology, or the study of bones His description of the bones of the body would not require great change to be

accurate today.

Galen's hypotheses of physiology, or the working of the various organs, were based on close and careful observation, but his interpretations were usually incorrect. When we realize that the writings of Galen completely dominated the practice of medicine for the next thirteen centuries we may understand how, with erioneous conceptions of the functions of the various organs, scientific progress was slow. It was not until hundreds of years later, when men arose who dared dispute the teachings of Galen, that real progress in medicine recommenced. Prior to Galen's time it had been understood that the arteries were air-containing. It was from this that the name was derived. Galen knew of the valves of the heart and determined the direction of flow of the blood as it entered and left the organ, but he did not appreciate that it was a pump for distributing the blood, regarding it rather as a furnace from which the innate heat of the body was derived He determined definitely that blood was present in the arteries and veins but he considered it to be of two different types and did not recognize that the blood circulates through a closed system including arteries, veins and capillaries.

During his time we find various schools of medical thought of which three were dominant. The first school considered of greatest importance the discovery of the cause of disease and its removal. The sole interest of the second was with the disease and not with the condition from which it arose The last group selected their remedies only on the basis of past experience, using what had previously been found in similar conditions to be beneficial, paying little or no attention to the mechanism by which the results were obtained treatment of disease at this time extracts of roots and herbs and similar preparations had a

great vogue.

The development and spread of Christianity was a distinct deterrent to scientific progress. With the advent of the conception that existence on the scart is of importance only as a preparation for the world to come, the evanescent problems of our life were greatly ignored. It was not so much that science was taboo as that in view of the teachings of Christianity science was superfluous «Does your skin roughen without baths? Who is once washed in the blood of Christineed not wash again.)

From the death of Galen, about 200 A D, up to 1542 the high water mark of the Renarsance, or rebirth, medicine was dominated by his teachings and, except in isolated localities, practically no progress was made. This was the period of which we speak as "The Dark Ages." Fortunately in three regions of the civilized world, the light was kept bunning, albeit dimly. Southern Italy and Sicily has always been more Greek than Roman and in this environment the school of Salernum became the centre of medical studies. The school flourished throughout this time and made some permanent contributions to the progress of medicine.

With the separation of the Roman Empire into the Western and the Eastern Empires, the latter, with its centre at Constantinople less influenced by the Christian doctine, kept alive the Greek medical tradition. Byzantine medical science gradually decayed, however, and by 1453, when Constantinople fell to the Moslem invaders, the few Greek scholars who remained were dispersed and with them went many

precious manuscripts

But the most important path through which the early Greek knowledge, the knowledge of Hippocrates and of Galen and their contemporaries, was kept alive was through the Ara-

bian infidels.

As the Arab hordes swept from Arabia across northern Africa conquering all in their path and finally subjugating parts of southern Europe, particularly Spain, their appetite for knowledge grew and they gathered to them the great scholars of the times, founding fa-

mous centres of learning.

«The world has but once witnessed so marvelous a spectacle as that presented by the Arabs in the 9th century. This pastoral people, whose fanaticism had suddenly made them masters of half of the world, having once founded their empire, immediately set themselves to acquire knowledge of the sciences which alone was lacking to their greatness. Of all the invaders who competed for the last remains of the Roman Empire they alone pursued such studies. While the Germanic hordes, glorying in their brutality and ignorance, took a thousand years to re-unite the broken chain of tradition, the Arabs accomplished this in less than a century They provoked the competition of the conquered Christians—a healthy competition which secured the harmony of the

«At the end of the 8th century, their whole scientific possessions consisted of a translation of one medical treatise and some books on alchemy Before the 9th century had run to its close, the Arabs were in possession of all the science of the Greeks; they had produced from their own ranks students of the first order and had raised among their initiators

men who, without them, would have been groping in the dark, and they showed from this time an aptitude for the exact sciences which was lacking in their instructors whom they henceforward surpassed.»

One in particular stands out during the Arabian domination, Avicenna, the «Prince of physicians,» the rival indeed of Galen, among the great names of medicine. Born about 980 A of he became a profile writer, and was the author of the most ramous medical textbook ever written. It was called the 'Canon,' and was followed so blindly that it came to be looked upon as intallible. It was indeed the

physician's bible

Arabian medicine made no noteworthy contributions to anatomy or to physiology since dissections were not permitted, but certain new and important discases were described and a number of valuable remedies were produced, derived chiefly from the vegetable kingdom. The Arabian hospitals were unusually well constructed and organized. Valuable contributions were made in the study of chemistry and chemical substances were introduced in the treatment of disease.

During the Renaissance, with the resurrection of desire for knowledge in Christian countries, medicine and other sciences were reclaimed from the Arabs chiefly through the Crisaders returning from the Holy Land and from the Arabian cultural centres in Spain.

In the 13th century great universities arose throughout Europe, many being associated more or less closely with the monastenes. Two men stand out as the torch bearers of the period, sturing others to a study of the phenomena of nature and of life. These were Albertus Magnus and Roger Bacon whose "cluef merit is that he was one of the first to point the way to original research as opposed to the acceptance of authority—though he himself still lacked the means of pursuing this path consistently." His teachings were a protest against the acceptance of the ancient tenes of Galen.

of Galen.
The dawn of medical Renaissance will always be associated with the name of one concerning whom contemporary and modern opinions have been at great variance. Paracelsus, called by many the prince of quacks, the greatest of charlatans, hailed by others as one of the greatest physicians. A true medical revolutionary, he was bombastic in his utterances and iconoclastic in his teachings. His fierce attacks upon the medical attitudes of the day brought him into trouble wherever he would go. With the established Church also he was persona non grata. Space does not permit a discussion of the interesting though erroneous teachings of Paracelsus. His contribution to the progress of medicine was in the realm of chemistry. Up to his time chief interest of the alchemists had been the discovery of the elixir of life, the secret of perpetual youth and the finding of some means by which gold might be made from the baser metals. Para-celsus' interest in chemistry on the other hand was based on his hope that many chemical substances might be found which would have definite value in the treatment of disease. He established the use of mercury in medicine, and recognized the value of other chemical principles. Paracelsus died in 1541.

The following year saw the publication of two epoch-making books in the history of science First, Copernicus, the great astronomer, demonstrated conclusively the existence of the solar system and the fact that the earth revolves about the sun. Second, Vesalius published his remarkable work on anatomy. From the death of Galen until 1512 our knowledge of anatomy had made but little progress.

Vesalius, a Belgian, was made professor of anatomy and surgery in the great University of Padua when he was but 25 years of age He was a tremendous student and a dominant personality. Men from the remotest parts of Europe attended his anatomical dissections and lectures Within three years he had collected enough material and had accumulated sufficient drawings of anatomical figures to place his

book in the hands of the printer.

Vesalius is the true tounder of modern anatomy. His anatomy is with few exceptions the anatomy of today. His writings, daring to question the authority of Galen, were received with scorn and abuse. Although he had enthusiastic friends, the majority were against him. He was a prolific writer and had volume nous and valuable manuscrips not yet published Thoroughly disgusted with the attitude of his fellow practitioners, in a fit of anger, he threw them all into the fire and gave up forever the study of anatomy. But his anatomy lives today and Vesalius will go down through the years as one of the great lights in medical history Not until 1542 did medicine have a correct con-ception or understanding of the anatomy of the human body.

In Padua, about 1000, we find a young English student, William Harvey, studying under one of the successors of Vesalius. Harvey's instruction in anatomy was the best of the period Remember that although anatomy had made distinct progress the physiology was still that of Galen. The vascular system was still understood to contain two kinds of blood, the heavy thick blood in the veins, which carried nourishment from the liver to all parts of the body, and the lighter blood containing the vital spirit which pulsated back and forth from the heart as the tide will ebb and flow, distributing vital heat and life to all parts of the body The lungs fanned and cooled this vital blood

acting as a bellows.

Harvey had studied the veins carefully at Padua and had observed, as had his teacher, the presence of small valves in the veins. This precluded the possibility of back flow in these vessels and further studies of the valves of the heart suggested to Harvey the possibility that the blood might circulate from the heart through the arteries into the veins and back again to the heart. By ingenious experiment Harvey proved the correctness of his theory and in 1628 published a small book in which he described his experiments and conclusions. This was the beginning of the science of experimental medicine. So great was the value and significance of Library's contributions. and significance of Harvey's contributions, not alone to medicine, that his book can be found today in Dr Eliot's collection of the greatest writings, the "Harvard Classics."

The establishment of the circulation of the blood was a small fact indeed when compared with the rest of our knowledge of physiology today, but it completely upset the only preexisting physiology, that of Galen. It was the beginning of modern physiology and from the time of Harvey to the present, knowledge of the workings of the human body progressed by leaps and bounds. All is not yet known but that which is known has been learned through experimental medicine rather than through mere

conjecture.

By the middle of the seventeenth century we find medicine in the possession of accurate knowledge of anatomy and ever increasing knowledge of the true physiology of the human body Now for the first time begins a study of the anatomical results of disease. Vesalius and many of his contemporaries had recognized abnormal conditions of organs at necropsy, but they had not followed these patients through life and had paid little attention to the ab-normalities. The establishment of modern pathology awaited a group of practicing physicians, one of the earliest and most notable of whom was Morgagin, who attended their patients making careful physical examinations and examined them after death, scarching explanations for the abnormalities found during life

Now the science, study and practice of medi-e progressed rapidly Pathology, the ancine progressed rapidly Pathology, the anatomical study of the results of disease, brought a much clearer perception of the nature of disease and enabled investigators to differentiate the types thereof. Among the leaders of the time we must pause to mention John Hunter, one of the greatest clinicians of his period, a man who combined the qualities of Vesalius, Harvey and Morgagni and who did more than all others before him to place treatment on a scientific basis. We are accustomed to divide the treatment of diseases into two epochs That from the time of Galen to Hunter, and the second from the time of Hunter onward Hunter marks the severance of the last link of the chain which bound physicians blindly to the teachings of Galen

In 1819 Lænnec devised the stethoscope thereby beginning the day of physical examina-tion in diagnosis. Richard Bright, in 1836, had studied the urme of diseased individuals and examined their kidneys at autopsy and had been able to demonstrate disease of these organs in individuals with albuminuria. Since then nephritis has been termed both popularly and in

medical practice, Bright's disease.

medical practice, Bright's disease.
In 1796 Jenner, a country physician, had successfully protected individuals against smallpox
The by moculation with the virus of cowpox significance of this discovery may be understood when we realize that at his time few individuals reached adult life without being marked with the dread disease. His work was revolutionary, but there was not even a beginning of understanding of the mechanism whereby the immunization was accomplished until fully sixty years later when Louis Pasteur, a young French chemist, began his work upon fermentation. This led to his study of the fermentative diseases of wines and beer and his discovery that they were due to minute living organisms. The microscope had been invented about 1590 Pasteur's work led to his conception of animal disease as due to similar microscopic viruses. There followed his invaluable work in eliminating disease in silk worms, then his successful immunization of animals against anthrax and of man against hydrophobia.

In 1876 Robert Koch a physician practising in a small town in Germany, founded the science of bacteriology. His discovery of the bacillus of tuberculosis revolutionized our methods of treatment of this disease. In 1867 Joseph Lister, an English surgeon, first applied Pasteur's and Koch's theories of the bacterial causation of disease to the prevention of wound infection during surgical operations. Previous to his time practically all surgical wounds had been infected and many had died from resulting septicemia. Lister's work in antiseptic surgery later was supplanted by modein aseptic surgery.

Can we conceive the pain and suffering of a serious surgical operation performed without anesthetic? Consider for a moment the tremendous boon to humanity in the discovery of the anesthetic properties of ether, first publicly established in Boston in 1846.

Morgagui, the founder of gross pathology was followed around the middle of the 19th century by Virchow, who transferred our conception of the seat of disease from the microscopic organ affected to the microscopic cell or unit of that organ.

During the second half of the 19th century continued advances in the study of the glands of internal secretion led to new conceptions of certain types of diseases and opened the way to the cure of certain previously in-

curable maladies.

Medicine of the last quarter of the 19th century was dominated by the knowledge of structural pathology, by the observations of men of the type of Morgagni and Virchow. Their chief interest was in the character and extent of the anatomical damage in the various organs Most of the knowledge acquired was at autopsy and showed the *results* of disease. Study of these characteristic and terminal changes, many of which showed little promise of being altered by therapeutic means even during life, tended toward decreasing confidence in the efficacy of various procedures in treatment.

Among the many advances in the knowledge during the first quarter of the twentieth century that in the study of functional pathology

has been perhaps the most helpful.

Since the advent of biochemical methods, we can now study in the clinical laboratory, the reaction of the various tissues of the living body to certain test reagents or can analyze accurately the chemical products of metabolism from different organs as found in the blood, urine or elsewhere.

Take for example the kidneys. During the dominance of structural pathology we studied the urine for evidence of kidney disease and, finding albumin and casts to be present, could state that the kidneys were affected. How serious was the extent of the damage we could only surmise. Indeed it was not until after the patient's death that we were able at autopsy to obtain a clear picture of the condition of the diseased organ.

Now, we may determine the secretory capacity of the kidney with the phenolsulphonephthalein and other tests, determine its ability to excrete solids with the two-hour renal test, learn concerning its ability to excrete water by the performance of a water excretion test, and through a study of the blood or even

of the saliva we may gain accurate knowledge as to whether substances which should be excreted by the kidneys are being dammed back into the blood stream. We can learn not only whether changes exist in these various features of kidney function but we may know at the same time how extensive are these changes. In other words we are in a position to study and to know quite accurately the functional capacity of the kidneys while the patient is still alive and can therefore more intelligently direct the treatment.

Progress in the knowledge and treatment of disease has indeed gone far Far from the incantations of the savages, from polypharmacy of the middle-ages when each root and herb had some curative function, God-given and begging for recognition. We have indeed gone far from that time when under the dominance of the «doctrine of signature» it was believed that the All-Powerful had indicated by a sign which plant should be used for each ailment, the liverwort for liver disease because of a superficial resemblance of its leaf to the human liver; flowers with red centres for inflammation of

the throat, and the like.

For a time after the worthlessness of great numbers of remedies had been demonstrated and when under the sway of structural pathology it appeared useless to attempt to alter by a simple medication such extensive and permanent changes as were discovered post mortem, medical leaders were inclined towards the doctrine of "therapeutic nililism" No medical treatment could be of great value in the face of the picture presented post mortem, but useless drugs and procedures having been weeded out, there remained a not inconsiderable number of remedies of proven value. Without them and their intelligent use the sufferings of humanity would be increased many fold.

And now, having established the correct value of most drugs, and ruled out those of doubtful worth, medical science is constantly adding remedies which have been tested experimentally and been proven efficacious though harmless New discoveries in hygiene and nutrition, in bacteriology, chemistry, immunology, allergy, endocrinology, surgery, pharmacology, and roentgenology are gradually being added to our therapeutic armamentarium. Not a year clapses but we see added at least one discovery of permanent value and it is safe to say that every decade one or two discoveries of the first order, such as smallpox vaccine, diphtheria antitoxin, rabies vaccine, thyroid extract, insulin, salvarsan, enriches our knowledge and bings further boon to humanity.

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MEDICINE, Preventive. See PREVENTIVE MEDICINE

MEDICINE, Recent Progress in. Two discoveries of the 10th century were of the utmost importance in facilitating progress in the medical sciences. The first was recognition of the fact that the ultimate unit of life in man is the cell, and that the basis of the study of disease is the study of diseased cells. The second was the discovery of bacteria and their

relationship to disease.

Both of these had perforce to await improvements in the microscope. The achiomatic lens was developed about 1810 Johannes Peter Muller first used the microscope in the study of tissues, m 1830 Cells could be recognized but scarcely studied with any degree of accuracy because at that time methods of staining, to bring out the internal structure, were unknown. In 1838, Matthias J. Schleiden had established the cellular nature of plants. Theodor Schwaim, a pupil of Muller, similarly established the cellular nature of animal tissues in 1839. Prior to the time of Rudolf Virchow (1821 1902), who was the founder of cellular pathology, the examination of diseased tissues was limited to their gross appearance. With the new concept of microscopic cells as the ultimate unit, and with improved methods of study of these cells, especially with stains, Virchow about 1850 mangurated the study of diseased tissue cells as well as normal ones Since that time no pathologist would get far in his contributions to our knowledge without the use of the microscope

Prior to the time of cellular pathology, physicians had been very adept in recognizing diseased organs or tissues, but, with few exceptions there was no way by which they could determine the manner and process of their hav-ing become diseased. Now, the origin of disease and the manner of its development and spread in the body could be adequately determined

Similarly the rise of bacteriology had to await improvements in the microscope. Naturally, the larger germs were discovered first. As early as 1839, Johann L. Schönlein discovered the germ causing favus, a skin disease. The epoch-making observations of Louis Pasteur (1822-1895) established a bacterial causation for many diseases, and the possibility of immunizing persons against bacterial invasion. Robert Koch (1880) developed methods by which bacteria could be separated, one from another, and from tissues studied and identified in the laboratory. From this point on, pathology and bacteriology proceeded hand in hand, the bacteriologist discovering the germs causing disease and how they are transmitted to man; the pathologist studying the manner of their propagation within the body, and the reaction of the body cells to their destructive activity.

The field of immunity developed parallel with that of bacteriology. The earliest successful attempt at immunization was long before, when in 1796, Edward Jenner demonstrated the practicability of vaccination against smallpox by the use of cowpox virus. However, nothing was known of the manner of its protection Pasteur and many others who shortly followed him, demonstrated the feasibility of immunization by vaccination Paul Ehrlich, who was primarily a chemist, soon presented his famous side-chain theory, which explains the mechanism of im-

munity (q v) and of the reverse state, hypersensitiveness or allergy.

Ehrlich was also the leader, at about the beginning of the 20th century, in the development of a new branch of medicine, that of chemical pathology. By then the microscopic study of disease had progressed far With the availability of newer procedures of analysis, chemical methods in the study of the various diseases progressed by leaps and bounds. Today the clinical laboratory for the diagnosis of disease is primarily a chemical laboratory. It was Ehrlich also who chiefly instigated the procedure which is so important today, that of manufacturing new, previously nonexistent synthetic drugs for the treatment of specific diseases. One of these, ar-sphenamine, also called salvarsan, or 606, was developed by Ehrlich for the treatment of syphilis, and was the first important chemotherapeutic agent to be synthesized for the treatment of disease.

Surgery, prior to the discovery of bacteria, was in a most unsatisfactory state. Operations were always done of necessity, as a matter of life or death. All surgical wounds were infected, and the surgeon's chief interest was in the type of infection following operation. When the appearance and odor of the pus exuding from the wound were of a certain type, the surgeons spoke of laudable pus. They even felt that it aided healing. Other types of pus presaged

Sir Joseph Lister (1827-1912), recognizing the significance of the newly discovered bacteria, and applying this knowledge to surgery, with sterilization of all materials, revolutionized the field and made possible the tremendous advances

of later years in aseptic surgery.

The 20th century has seen equally important advances These have included recognition of the importance of vitamins, those minute food constituents so necessary to continued health; the activities of the glands of internal secretion, such as the thyroid gland, the pituitary, adrenals, pancreas, and sex glands, and their importance in promoting body growth, controlling the hooly metallolism, and correlating trolling the body metabolism, and correlating the vital functions of the many specialized tis-sues of the body; recognition and explanation of the processes of allergy, which explain a number of diseases such as asthma, hay fever, migraine, hives, eczema, which the method of cellular pathology and bacteriology had failed to elucidate; and the discovery of the antibacterial effects of the sulfonamide drugs and penicillin.

Paralleling these advances in the laboratory study of medicine were equally important changes in the attitude of the medical profession toward the problems of clinical medicine. This was especially noteworthy in the treatment of the insane who in the past had merely been segregated and often treated abominably. More intelligent study of insanity demonstrated that

many forms are curable.

Specialization in limited fields of medicine and medical research was a natural consequence of this tremendous broadening of the field of medical knowledge. No one man could adequately or efficiently cover the entire field, and special fields of concentration were taken up by different investigators, as they are today by different men in the practice of medicine. This has represented a very distinct advance in both research and clinical medicine.

Advances in the control of all varieties of diseases, based chiefly upon the discoveries since about the middle of the 19th century, as briefly outlined above, have been enormous. These may outlined above, have been enormous. be seen objectively in the tuberculosis sana-toriums where diagnosis of the disease is no longer tantamount to sentence of death, in the psychopathic hospitals where the insane are intelligently treated and often cured, in the public health administration of cities, states, and countries where the dread scourge of epidemics and social diseases has been greatly eliminated; in military medicine where death from disease has been reduced from over 90 per cent of the casualties in the armies of Napoleon to less than 5 per cent today. It is seen in the work of sanitation which has eliminated the major poition of malaria, yellow fever, hookworm and other parasitic infections and has made possible the building of the Panama Canal; in the splendid institutions and hospitals developed for the investigation of special diseases such as cancer, anemia, tuberculosis; and in the great clinics in which numerous specialists in as many fields have pooled their knowledge and abilities for the benefit of the individual

With a subject as ancient as medicine a discussion of recent advances could start at nearly any point since about 1600, when the method of experimental investigation was first introduced by William Harvey. However, much of this is discussed in the article Medicine, History of (q.v.) The more recent advances have been mentioned above in a very general way. The discussion of specific advances which follows will be limited to the period following

World War I.

We may speak of discoveries of the first order; of the second order; and thirdly, of progress that has come, not as a new or startling discovery, but gradually, as a result of the cumulative effort and investigations of a large

number of contributors.

Discoveries of the first order in medicine have occurred irregularly, at longer or shorter intervals, averaging perhaps one every five or ten years. These include the description of hitherto unrecognized diseases, discovery for the first time of the cause of a disease; or its cure, or the promulgation of a completely new theory or explanation of the mechanism of some

disease process

Virus Diseases.—The term "virus" means poison and was used early in bacteriology to designate a living or bacterial poisonous substance. All germs were viruses. But, as the cause for one infectious disease after another was discovered, each was given its name, and gradually the term came to designate a germ which had not yet been discovered, but the existence of which was made obvious by its

While bacteria are small they are still large enough so that they may be seen through a high-powered microscope. They are large enough that when fluid containing them is filtered through the minute pores of a porcclain filter, the bacteria are held back and the fluid which emerges through the porous earthenware is free from germs Bacteria which can be held back by a porcelain filter are usually large enough to be seen with a microscope But there are some that are so small that they will even pass through the minute pores of the filter. They are

so small that they cannot be seen with any ordinary microscope. Some of them, however, have heen visualized under the enormously powerful electron microscope. Even if they should be discovered, therefore, they would still be invisible and we would know them not so much by what they are as by what they do Such germs have been termed filterable viruses

Since World War I, investigators have established that there are a large number of filterable viruses and that the majority of these behave m a different manner from the larger bacteria. When bacteria invade the body, they live in the body fluids and penetrate between the living tissue cells. But viruses actually penetrate the cells themselves and, indeed, appear unable to live

outside of living cells

The term "virus" is now limited to those discase germs which are ultranucroscopic, invisible and which live and reproduce inside other living cells. Much work has been done on viruses since World War I, and an entirely new field of bacteriology has been explored in order to cope with the virus problem. Methods of study which were adequate in ordinary bacteriology are in-adequate with viruses. The former could be grown in artificial culture media in the laboratory. The latter will not grow outside of living tissues. This made the problem of their labora-tory study most difficult until it was demonstrated that chicken embryo culture, which is a test tube culture of hving embryonic cells, continuing to grow in artificial environment or inside of an meubating hen's egg, are adaptable for the growth of viruses. Many years ago Di Alexis Carrel succeeded in removing the heart muscle cells from a chicken embryo as it was growing in the egg and, transplanting these to a test tube in which sufficient nourishment was available, kept the cells growing for an indefinite period Now that there is available a method for

growing viruses in the laboratory, progress should be quite rapid. Indeed it has already been demonstrated that the cowpox virus may be grown in this manner and cowpox vaccine is now made in test tubes. This is a great improvement over the old method of vaccination against smallpox with infected fluid obtained

from cattle.

Diseases recognized today as due to viruses are the following: measles, German measles, mumps, fever blisters, herpes zoster or shingles, chickenpox, smallpox, smallpox vaccination or vaccinia, tabies or hydrophobia, psittacosis or pairot fever, the common cold, influenza, encephalitis, poliomyelitis or infantile paralysis, yellow fever, dengue fever, foot and mouth disease, warts, and a few more which are quite uncommon.

Influenza.—In the fall of 1917, during World War I, there occurred the most severe epidemic of influenza that the world has ever known. Indeed it was rightly termed a pandemic since it involved the entire world. There have been epidemics of this disease in the past, indeed at intervals of about 10 to 30 years. The history of epidemic influenza may be traced back even to the 4th century B.C., and undoubtedly it existed previously although records thereof are not available. Over 5,000,000 persons are estimated to have died from this disease in this last great pandemic. One probable reason for the high invasiveness of the disease in 1917 and 1918 was the unusual concentration and movement of troops which carried with them the virus of infection. There is evidence that where the facilities exist for a germ to spread rapidly among nonunmume individuals, the germ tends to increase rapidly in its virulence, its destructive capacity. The crowding that necessarily occurred in camps and troop ships provided this facility. Once the germ had acquired its increased virulence it was able to spread more easily among less congested populations. Since the infection appears to be airborne, the excellent saintary provisions of military science were of little value in preventing its spread.

The germ which causes epidemic influenza cluded detection for a long time. Prior to the endenic of 1890, bacter to logy was an inborn science. With that epidenic, however, every effort was made, with the limited facilities ayailable, to discover the offending agent. Richard F. G. Pfeiffer, a German bacteriologist, did discover a germ which he believed to be the cause of influenza and he designated this the influenza bacillus (1892). Today we know that the mfluenza vacillus, like the pneumococcus and streptococcus, is found in many cases of influenzal pneumonia, but in the last epidenic it was proved that these three germs are secondary invaders, not the primary cause of the disease. The germ causing influenza so reduces the resistance of the body against infection that these other germs which are often normally present in the throats of well persons have no difficulty in invading the tissues, especially the tungs, thereby produc-ing pneumonia. These secondary invaders are equally as important as the primary cause since they are responsible for many of the deaths from influenzal pneumonia.

There are at least three different filterable viruses which may cause epidemic influenza. The first of these was discovered in England in 1933 by William Smith, Patrick P. Laidlaw, and Christopher H. Andrewes, and is called influenza A virus. The second was discovered independently by Thomas P. Magilt and by Thomas Francis in the United States in 1940, and is called influenza B virus. It has been shown that some cases of epidemic influenza are due to neither of these two agents, and accordingly it is presumed that there must be one or more viruses yet undiscovered which can cause influenza of the epidemic variety. It is believed that the common illness known as grippe is a variety of influenza, and that it is due to a virus. However, it is known that grippe is not caused by any of the viruses which commonly cause epidemic influenza.

At the time of writing this article, no specific treatment had been discovered for influenza. The sulfonamide drugs and pencillin had not proved effective in curing the disease and no vaccination had been devised which had proved efficacious in preventing the disease. Several vaccines were in process of evaluation, one of which appeared to be promising.

Poliomyelitis (Infantile Paralysis).—This is a disease caused by a filterable virus, which is transmitted from person to person in some way which is not yet fully understood, although it is proven that the virus is present in the feces of infected individuals, and that it may be carried by flies. In the majority of infected individuals it is very mild, causing no paralysis, scarcely more than the symptoms of an ordinary

liead cold. It is only the unusually severe case which develops paralysis. Present evidence indicates that most persons have the infection so middly that it is not recognized and that in this way they become immunized. This is especially true in congested population centers. (See discussion of similar facts concerning diphtheria, under Toxins and Antifoxins.) The opportunity for spread of infection is much less in airial sections, and it is because of this fact that earlier investigators noticed that it was a disease of less congested districts and one in which direct transmission from one patient to another could raiely be traced. The transmission, as a matter of fact, appears to be carried by apparently well persons who have previously had the disease in mild form.

It seems to be a very common disease of childhood which most of us have had. Vaccines have been prepared and used as preventive measures in epidemics of infantile paralysis but they have not been proved to be of value. It has been shown especially in monkeys that the virus enters the central nervous system through the nose, passing up the olfactory nerves to the base of the brain. It has been found that monkeys may be protected by spraying the nose with tannic acid which blocks the nerves so that the virus cannot grow upward through them. In 1936 this method of protection was tried on large groups of humans in Georgia and Alabama, with evidence of some protection, but not as much as had been hoped for.

Insulm.—Diabetes mellitus is a disease of remote antiquity, having been described by the great Hippocrates 400 BC. It is quite wide-spied, there being more than 2,000,000 sufferers in the United States. It is not an infectious disease, but is due to a defect in metabolism, whereby the pancies or sweetbread does not secrete the proper internal secretion, insulin, into the blood. Insulin controls the metabolism of

Formerly the victim of diabetes rarely lived more than two years. In 1898 a German physician, Bernard Naunyn, first conceived the idea that diabetics should not eat large amounts of sugar. The dietary treatment prescribed by Naunyn was followed by physicians from 1898 to 1914. During that period the average duration of life of a diabetic was 22 years From 1914 to 1922, following the teachings of Frederick M. Allen of New York, diabetics were kept undernourished. This was what was popularly known as the starvation treatment. Of course, it was not a matter of starvation but of underfeeding, so that the metabolism might have an opportunity to regain some of its activity. During the undernutrition period which extended from 1914 to 1922 there was little improvement. The average duration of life was 24 years.

The average duration of life was 24 years.

In 1922, Sir Frederick Grant Banting and Charles H Best of Canada reported a discovery of the first order in medicine. After many trials based upon the previous unsuccessful work of a number of very competent men, they finally succeeded in preparing insulin in the laboratory. From 1922 onward, the diabetic has been able to inject into himself with a hypodermic needle the substance which the pancreas no longer manufactures. As long as he continues to take insulin injections, he remains free from diabetes. Although this treatment must be continued quite indefinitely, the patient otherwise becomes a normal

individual and his life expectancy approaches much more nearly that of a nondiabetic

It is no easy task to take from two to four hypodermics each day. In 1930 a Danish physician, Hans C. Hagedorn, discovered that it in the laboratory he combines insulin with protamine, the latter renders the former relatively insoluble. When protamine insuling is injected under the skin in this relatively insoluble state it is delivered gradually into the blood, thereby maintaining insulin action over a much longer period of time. Since 1936, diabetics formerly requiring two hypodermics daily now need to take but one, those requiring three or four, need to take but two

Pernicious Anemia.—Like insulin, the liver treatment of permicious anemia is a discovery of the first rank. There are many varieties of anemia, such as that associated with chronic infection or sepsis, those due to dietary deficiencies, to intestinal parasites, and to acute hemorrhage or chronic loss of small amounts of blood, such as occurs sometimes in hemorrhoids There is another type of chronic anemia in which no cause such as those mentioned above can be discovered. This is called putmary or permeious or idiopathic anemia. Until 1926 its cause was unknown and it was incurable. The disease is characterized by an anemia in which the red blood cells are reduced proportionately more than the hemoglobin of the blood There is never any free hydrochloric acid in the gastric secretion as there should be. The spleen is usually enlarged. The disease normally progresses with remissions in which the patient improves temporarily, but the ultimate outcome has always been fatal. Blood transfusions help only for a short time

In 1926, George R. Minot and William P. Murphy of Boston, Mass, discovered that the feeding of liver cures the disease. The liver feeding must be continued. With their associates they devised a liver extract which is equally as curative as whole liver itself. This may be given hypodermically, or by mouth William B. Castle of Boston demonstrated that the disease is due to the absence of some necessary factor in the stomach secretion Beef is not curative, as is liver. But if beef is predigested by a mixture with normal gastric juice, it becomes as curative as liver extract. Something had been added from the gastric digestive secretion of the normal individual, which was absent from the patient with per-nicious anemia. It was not hydrochloric acid although hydrochloric acid is also absent.

As in diabetes, liver extract treatment must be continued indefinitely, because like diabetes pernicious anemia is a deficiency disease. As long as the treatment is continued, the patient remains normal. In 1945, it was discovered that a chemical substance, folic acid, allied to the vitamins, would exert curative effects in pernicious anemia, when taken by mouth, very similar to those of liver extract. The relative advantages of treatment with liver extract and folic

acid are still under investigation

X-Rays.—The discovery by Wilhelm K. Roentgen in 1895 of what has since come to be generally known as the X-ray was an advance of the first order for medicine. At first X-ray pictures taken through the body were crude indeed. The method enabled the rays to penetrate only such relatively thin structures as the hands or arms, and the time required to take a photo-

graph was measured in minutes. Today X-ray pictures may be taken through the entire body in a fraction of a second, these even show the homes of the spine, infinitely more clearly than the carly pictures showed the bones of the hands

At first the procedure was of use only in the study of tissues of varying density. The bones being more dense than the soft tissues, were more resistant to the passage of the X-ray and therefore east a shadow upon the photographic film Hence pictures of bone were easily obtained. The lungs could also be studied because. on account of the air contained, they were of different density from surrounding structures such as the heart and blood vessels. However, when it was found that certain harmless chemicals, such as bismuth and battum, prevented the passage of the ray, methods were developed by which the patient could swallow these substances suspended in milk. In taking an X-ray of the stomach, one does not actually X-ray the wall of the organ, but rather a mold of the organ made up of its contents, the barum. As the baruun meal passes on down the intestinal tract, eventually to the rectum, pictures of it give the examiner a correct idea of the condition of the organs which it fills.

Later, a radiopaque fluid was developed which could be injected into the bladder through the methra and even on up through the meters into the pelvis of the kidney. The entire urmary tract was then susceptible to X-ray examination, Still later, it was found that a dye could be mjected into the blood stream through a vem in the arm which would be excited through the kidneys. In the mine it became much more highly concentrated and was radiopaque. This accomplished the same purpose much more simply than the introduction of the material through

the urethra,

Still later, another dye was discovered which could be taken by mouth or injected intravenously and which was excreted, not by the kidneys but by the liver into the gall bladder. In this way the gall bladder may be X rayed, lodized oil may be introduced through the

trachea into the lungs, with resultant visualiza-tion of the bronchi. It may also be introduced into certain of the sinuses for the diagnosis of sinus disease. Solutions containing iodine may he injected into the circulation so that blood vessels, and even the chambers of the heart, containing the radiopaque material are outlined in X-ray pictures

Even the brain may be X-rayed, following

the process of trephining, and the injection of air into the ventricles, in the middle of the brain. This is of great value in the diagnosis of brain

tumor.

Improvements in X-ray diagnosis have been a matter of gradual evolution. Much of what has been described above has been accomplished in the years following World War I. During that war X-ray apparatus was relatively crude and cumbersome. Furthermore, operators thereof were not adequately safeguarded against exposure to the effects of the X-ray and there were a number of cases of severe burns among X-ray operators in the army. The machines in use today show very little resemblance to the earlier ones and are adequately safeguarded to protect the operators.

While advances in X-ray diagnosis have been

truly remarkable, those in X-ray treatment have been more so. Formerly radium was much more efficacious as a therapeutic medium than X-1ay Both accomplish results by a similar process, but radium rays, being much shorter than X-rays, are more powerful. Also they are less harmful. With treatment machines of 300,000 volts, even 1,000,000 volts, everything that could be accomplished by radium can now be accomplished equally well by X-1ay treatment which can be more easily controlled. It is used m cancer, in the treatment of buthmarks, eczema. fungous intections of the skin, asthma, smus mfection, leukemia, menorrhagia, and several

other less common diseases

Other Diagnostic Methods.—The use of X-rays is perhaps the most important but by no means the only great advance in diagnostic methods which has occurred within recent years Since the beginning of the 20th century literally hundreds of methods for the more accurate diagnosis of disease and supervision of treatment have been introduced into medical prac-These now constitute an enormously important part of the means which the doctor has at his disposal in the management of patients There are those who decry the dependence of the modern physician on laboratory tests, and compare him untavorably with the doctors of a generation ago, who seemed to do very well with no other facilities than the five senses which nature gave them. This point of view fails to take into account the immense strides which medicine has made in the past half century. Doctors are now able to diagnose with certainty hundreds of new diseases which never were heard of a generation ago, and to detect the old diseases much carlier in their course. They are able to do this largely by the use of a multitude of tests and instruments which have come mto being. A physician who attempts to practice without these aids is at just as much of a disadvantage as is a sea captain who refuses to enjoy the benefits of the steam engine and radio communication. There is space here to consider only a few of the new tools which doctors have at hand today.

Analysis of the chemical constituents of the blood is indispensable in the diagnosis and treatment of many conditions. Diabetes, kidney disease, and diseases of the liver are a few of the illnesses where blood chemistry is of importance. Culture of the blood for bacteria is of the greatest aid in diagnosing and estimating the probable outcome of a host of bacterial infections. Secological tests on the blood have simplified the diagnosis of syphulis, typhoid fever, undulant sever, and typhus sever. Other types of blood tests are essential in the diagnosis of leukemia, malaria, pernicious anemia, and many other types of anemia. Analysis of the urine is indispensable in recognition not only of kidney diseases but also of many diseases of the body as a whole. The electrocardiograph makes clear the nature of heart conditions which were never even suspected before this instrument came into use. The electroencephalograph is a valuable tool in the detection of organic brain disease. The bronchoscope enables the physician to see the inside of the lungs, as well as to remove foreign bodies from the bronchial tubes and to administer treatments to parts which would otherwise be inaccessible. The gastroscope discloses the inside of the stomach and the proctoscope that of the bowels, making it possible to distinguish between cancers and other conditions so that the patient may be spared an unnecessary operation.

These tests and instruments, and many others like them, have played an important part in the advances which medicine is making. Forward-looking doctors hope for not fewer, but rather

more diagnostic methods in the future.

Endocrinology.—1) uring the 20th century there has come into being a great body of knowledge concerning the endocrine glands. development of this knowledge and its application to the problems of certain diseases in man comprise one of the great advances of medicine in modern times These glands, located within the head, neck, and abdomen, include the pituitary, thyroid, parathyroid, and adrenal glands, the testes of the male, the ovaries of the female, and certain glandular structures inside the pancreas. These endocrines produce secretions, called hormones, which pass into the blood stream, which carries them throughout the body Each hormone has actions on various tissues and organs, and these actions are necessary to the normal working of that part. Some of the important actions of hormones are the regulation of growth and development, the control of metabolism—particularly that of carbohydrate, salt, calcium, and water—the maintenance of blood vessels, muscles, and intestines in good working condition, and the regulation of sexual functions. If the normal secretion of a hormone becomes diminished below a certain level for any reason, then some aspect of the physiology of the body becomes deranged, and a condition of disease supervenes. For example, if the pancreas ceases to secrete sufficient insulin into the blood, the well-known disease, diabetes, occurs. If, on the other hand, the secretion of a hormone becomes excessive, ill health will also follow An example of this is the growth to gigantic stature which occurs if the pituitary gland of a child secretes an excess of its growth hormone.

In general, disease which results from insuf-ficient secretion of a hormone may be successfully treated by replacement therapy consisting of oral dosage or injections of hormone obtained by extracting the corresponding endocrine glands of animals. The insulin used in the treatment of of animals. diabetes is obtained from the pancreas of cattle. Hormones of some of the endocrines, such as the thyroid, the adrenal, the testis, and the ovary, have been prepared in pure chemical form. Knowing the chemical structure, it has been possible to make some of the hormones synthetically, or at least to prepare a compound which is so like the hormone that it will produce the same effects in the body. These synthetic hormones are now in use in place of natural hormones in the case of the adrenal gland, the testis, and the ovary.

Excessive secretion of a hormone usually results from an abnormal increase in the size of an endocrine gland, often from an actual tumor of the gland. So far, such conditions have been treated successfully only by surgical removal of

a part of the gland.

Vitamins.—Since about 1915 knowledge has been increasing steadily concerning vitamins. These chemical substances, present in minute amounts in foods, are necessary for the maintenance of health and the prevention of disease. Vitamins provide no energy or substance for the

body, as do carbohydrates, proteins, and fat, but if the organism is deprived of them pathological charges occur, just as an engine which derives its power from gasoline or steam will develop trouble if its working parts are deprived of oil to keep them functioning properly. In 1914 the vitamins which had been recognized were A, B, C, D, E, and K It was known that many others existed, but knowledge of them was incomplete.

Vitamin A is chemically an unsaturated al-cohol derived from the yellow pigment, beta-carotene. Eggs, whole milk, yellow colored vegetables, and leafy given vegetables are rich sources of it. Deficiency of it results in dryness and scaliness of the skin, night blindness, and possibly in lowered resistance to infectious.

Vitamin B consists of a large number of factors better described as the B complex. Nine of these have been isolated in pure chemical These are as follows: (1) thannne hydrochloride, deficiency of which produces changes in the nervous system and mental state; (2) riboflavin, deficiency of which causes degeneration in the nervous system, skin eruptions, soreness of the lips and tongue, and changes in the eyes; (3) micotinic acid, lack of which results in pellagia, (4) pyridoxine, lack of which seems responsible for some of the lesions in pellagra; (5) choline, which is necessary to prevent abnormal deposition of fat in the liver; and (6) biotin, (7) pantothenic acid, (8) mositol, and (9) para-aminobenzoic acid, all of which have been found to play a role in the nutrition of animals but none of which are yet evaluated with respect to human nutrition. Important sources of the members of the B complex are meat, liver, whole grain cereals, yeast, and certain nuts and vegetables.

Vitamin C is the chemical compound, ascorbic acid. Lack of it causes scurvy. Citrus fruits, tomatoes, berries, spinach, and cabbage are the richest natural sources of it.

Vitamin D, which is a sterol, is found most abundantly in fish liver oils, and to a less extent m egg yolk, butter, cream, and milk. It is necessary for the normal calcification of the bones,

and deficiency of it produces rickets in children, and softening of the bones in adults.

Vitamin E belongs to the class of chemical compounds called tocopherols. The richest source of it is the oil derived from wheat germ. In animals, lack of this vitamin makes it impossible for reproduction to occur, but it is not yet certain whether the same is true for the human species. There is also evidence that deficiency of this substance may be concerned in various neuromuscular disturbances in man

Vitamin K is a derivative of the chemical substance naphthoquinone. Green leaves, such as spinach and cabbage, are the principal natural sources of it. When the body is deprived of this vitamin, the normal mechanism for the clotting of blood is disturbed Vitamin K deficiency may occur as the result of either an inadequate intake of the substance or a faulty absorption of it. Absorption is impaired whenever a sufficient amount of bile salts fails to reach the intestine from the liver and gall bladder, as often happens in diseases of these organs.

Allergy.—Idiosyncrasy to certain foods such as tomatoes, strawberries, onions, and shellfish is undoubtedly a very ancient experience on the part of certain individuals of the human race. Drug idiosyncrasy, such as to quinine or aspum, is not new

In the first decade of the 20th century, immimologists were investigating a very curious condition known as anaphylaxis or allergy in which experimental animals appear to be made more susceptible to poisoning from certain apparently harmless substances. This appeared

to be the reverse of immunity

In 1911 it was demonstrated by L. Noon of London that asthma and hay fever were anaphylactic or allergic diseases. Since then a large number of diseases of previously unknown causation have been shown to be allergic. This includes asthma, hay lever, migraine or sick headache, unticatia or lives, many forms of eczema, nucous colitis, much chronic indigestion due to food idiosynciasy, and a number of other less common diseases.

It has been demonstrated that from 7 to 10 per cent of the population of the United States is rather highly allergic and that about 50 per cent is mildly allergie to one or another substance with which they come in contact.

Much clinical work has been done on the subject, especially since 1920 Methods have been developed by which physicians may discover the offending agent whether it be food. pollen, drug, dust, feathers, dog hair, cat hair, or some other environmental substance The skin test has now become familiar to all, and treatment either by avoidance of the offending substance or by the process of building up an immunity to it, known as desensitization, has given relief to these individuals who heretofore have been chronic sufferers from disease.

Sulfonamide Drugs. -- In 1908 the German chemist, P. Gelmo, synthesized a derivative of chemist, 12. Genno, synthesized a derivative or benzine containing two amino groups and a sulphur molecule, for which the chemical name is sulfanilamide. This compound was used in the dye industry but no use of it was made medically until 1932, when another German, Gerhard Domagk, discovered that a derivative of sulfamlamide, prontosil, would cure mice of an ordinarily fatal infection with streptococci, Domagk did not announce his discovery until 1935. When he did so, it was rapidly taken up by medical workers all over the world, and it was quickly appreciated that one of the greatest medical discoveries of all time had been made, Since 1935 a number of drugs closely related to sulfanilamide have been discovered and introduced into medical practice. These all have the same basic chemical structure and differ from one another slightly in therapeutic efficacy and in toxicity to the human body. Sulfapyridine, sulfathiazole, and sulfadiazine are the drugs which have been most widely used, and of these, sulfadiazine in 1944 was the one which was considered to be the drug of choice. These drugs as a group are referred to as the sulfonamide drugs

The sulfonamide diugs are one of the greatest medical discoveries, since they are the first therapeutic agent known to exert a curative effect within the human body against bacterial infections. They have no value against any diseases except those due to bacteria. The bacteria against which they are proved effective include the pneumococcus, the streptococcus, the meningococcus, the gonococcus, and the colon bacillus. These bacteria are the commonest causes of pneumonia, meningitis, septicemia, childbed

fever, and many other serious, common infections. Unfortunately, the sultonamide drugs are wholly meflective against many other common infections, such as tuberculosis, diplitheria, typhoid fever, syphilis, and infections due to filterable viruses, such as measles, mumps, clickenpox, influenza, and the common cold. The drugs are life saving in those conditions where they are effective. For example, their use has reduced the mortality in pneumonia from 35 to about 7 per cent, and that in meningitis from about 30 to less than 5 per cent. When we consider that pneumonia used to be one of the pincipal causes of death in otherwise healthy persons, it is easily appreciated how many millions of lives have been saved already by sulfonamide treatment.

It is of interest to note that these drugs cure infections not by actually killing bacteria within the human body, but rather by interfering with bacterial metabolism in such fashion as to prevent the multiplication of the germs. When the multiplication of the infecting organisms is thus prevented, the natural detences of the body are able to deal with the bacteria which remain.

The sulforamides may be taken by mouth or injected into the veins. They are excited in the urme, and in order to maintain an effective concentration of drug in the blood, it is necessary that doses be taken at regular intervals as long as the treatment is necessary. Unfortunately, these drugs have certain toxic effects on the human body, and 5 to 10 per cent of individuals who take intensive sulfonamide treatment develop some toxic reaction, such as fever from the drug, a skin rash, an abnormal reduc-tion of the white blood cells, or irritation of the kidneys. If these reactions are not detected soon after they occur, very serious consequences may ensue, and even death occasionally results. For this reason, a careful medical practitioner will require that a patient taking intensive treatment with a sulfonamide drug have examinations of the name and blood counts made at intervals of a few days, as well as close supervision by the doctor humself.

An important development in sulfonamide treatment is the use of the drugs for preventing the development of intections. It has been tound, largely from experience with the armed forces, that daily dosage with a very small amount of sulfonamide will prevent individuals from contracting infections with which they come in contact. For example, such small daily dosage has proved effective in preventing the spread of epidemics of scarlet fever and meningitis in army

The sulfonamide drugs have aroused such mense interest in chemical and medical research workers since 1935 that an enormous amount of work has been done in this field and many of its possibilities have already been exhausted. For example, it seems unlikely that any new sulfonamide will be discovered which will be more effective than those in use at present against a variety of bacteria. However, there may be further advances in the development of drugs for use against particular infections. Already there is hope that the future will bring us a sulfonamide derivative effective against tuberculosis.

Penicillin.—As stated in the section just preceding, the advent of the sulfonamide drugs was an epoch-making advance in the treatment and patients in the home, that is to say, patients

of bacterial infections. Another great advance in the same field was made, but not appreciated, by Alexander Fleming in London in 1929, when he discovered that the mold *Penicillum notatum* would inhibit the growth of bacteria. Unfortunately no use was made of this discovery until 1940, when Howard W. Florey, Ernst B. Chain, and their collaborators, working at Oxford University, reported that penicillin, an extract of the mold, was singularly effective against infections in mice. This discovery came just at a time when any agent effective against infection was sure to be snatched up by medical workers all over the world because of its applicability to the problem of infection in war wounds. This is exactly what happened, and since 1940 our knowledge of penicillin has grown at a phenomenal rate, largely due to the fact that a strable part of medicine's war effort was concentrated in this field.

The penicillin used in treatment is a highly refined extract of the mold prepared by a laborious process. Huge quantities of mold are required for the production of a very small amount of the extract, penicillin. For these reasons the drug was at first available only in limited quantities at a high cost. By 1944 methods of production were so improved that penicillin was available in sufficient quantity to meet all urgent needs. Furthermore, the chemical structure of penicillin has been determined, and the drug is now being prepared in pure, crystalling form. There is now hope that eventually this medicine may be manufactured synthetically on a

commercial scale at a low cost

Pencillin has been proved effective against infections due to staphylococci, streptococci, pneumococci, meningococci, gonococci, and the gas gangrene bacillus. It also exerts a powerful effect against the spirochaete which causes syphilis, but it is not yet ceitain whether it will cure this disease permanently. Like the sulfonamide drugs, pencillin is ineffective against tuberculosis, typhoid fever, diseases due to filterable viruses, and a number of other bacterial infections. It has no value whatsoever in any diseases except those due to bacteria

Penicillin is poorly absorbed into the blood stream when it is taken by mouth, and accordingly it must be injected into the veins or muscles. Since the drug is rapidly excreted in the unine, it must be injected at intervals of a few hours in order to maintain an effective concentration in the blood. Unlike the sulfonamides, this drug appears to have no serious toxic effects on the human body. In 1944 the exact mechanism by which penicillin cured infections was not yet known.

Penicillin possesses several advantages over the sulfonamide drugs. It is highly effective against some bacteria, such as the staphylococcus, against which the sulfonamides are weakly effective, or not effective at all. It will cure some infections which are usually susceptible to sulfonamide but which occasionally fail to respond to it, such as so-called sulfonamide-resistant gonorrhea Perhaps the greatest advantage of penicillin is its lack of toxicity. It seems unlikely, however, that penicillin will entirely supplant the sulfonamides because it has to be mjected at frequent intervals, a disadvantage which will probably retain a place for the sulfonamides in the treatment of ambulatory patients and patients in the home, that is to say, patients

to whom frequent injections cannot be given

conveniently.

Psychosomatic Medicine.—It has long been recognized that the state of an individual's emotions may have a direct effect on the workings of his body. This fact is well illustrated by the phenomena of blushing, in which a mental state characterized by shame or embarrassment causes a sudden dilation of the minute blood vessels in the skin of the face and upper torso Similarly, a mental state induced by sudden shock or guef may cause fainting, which occurs because the circulation of blood to the brain is suddenly reduced, or a state of fear or apprehension may result in looseness of the bowels, which results in this instance from changes in the function of the muscular walls of the intestines. It has been increasingly recognized that disturbances in a person's emotional state may be the cause of, or at least an important factor in, the genesis of many symptoms and diseases. The special department of medicine devoted to investigation of illnesses engendered by emotional factors is called psychosomatic medicine. We can illustrate the problems of psychosomatic medicine by the example of two very common diseases.

Ulcers of the stomach or duodenum are well known to occur particularly in persons who are living a tense, heetic sort of life, and who are prone to worry and have feelings of resentment and uncertainty. The cause of ulcer has long cluded investigators Recently, however, it has been shown by actual observation of the lining of the stomach that a variety of emotional states, known to be prevalent among sufferers from ulcer, are associated with marked changes in the physiology of the stomach, such as engorgement of the mucous membrane with blood, secretion of excessive amounts of hydrochloric acid, and changes in the muscular contractions of the stomach. It has been observed that the lining of a stomach altered in this fashion is very susceptible to injury, so that even slight scratching of it will produce a bleeding sore. These observations make it very easy to understand that ulcers may form very readily in the stomach of an individual whose gastric physiology is deranged due to his state of mind. It is not yet certain whether such facts provide the entire explanation of the cause of ulcer Certainly it would seem that they must be responsible in part, at least.

Another very common disease is the severe, recurrent type of headache known as migrame. The cause of this disorder has long been sought, and many explanations have been offered for it, none of which satisfied all the workers interested in the subject. It has been recognized that persons who suffer from migraine are of a particular personality type, characterized by conscientiousness, attention to detail, and love of order. Within the past few years it has been demonstrated that the attacks of migraine headache are associated with a dilation and increased pulsation of the arteries of the brain. This vascular change seems to occur somehow as the result of the individual's state of mind. The headaches can be relieved by the injection of a drug called ergotamine, and it has been shown that this relief occurs concomitant with a decrease in the pulsation of the cerebral arteries

The examples of ulcer and migraine show instances of specific diseases in which the emotional state of the sufferer appears to play an impor-

tant tole in the causation of symptoms. It seems certain that many less specific states of ill health are likewise dependent on alterations in the emotional make up For instance, it is clear that many of the vague gastrointestinal symptoms from which persons suffer, for which no serious cause can be found, are due to alterations, such as spasms, in the intestinal tract, and that palpitation of the heart is frequently due to nervous influences, all resulting from emotional insta-

The concepts of psychosomatic medicine are important from the standpoint of treatment, for it should be obvious that an individual suffering from an illness of emotional origin is much less likely to get permanent relief from drugs than he is from psychotherapy, which attempts to provide relief of the mental stresses which are

the basis of his difficulties

High Blood Pressure.—Abnormally high blood pressure is one of the most important causes of ill health and death among middleaged and elderly individuals. A small percentage of all cases of high blood pressure is due to specific causes such as tumors of the adrenal glands, congenital cardiac detects, and senous kidney disease. The great bulk of sufferers from high blood pressure show no such cause for the abnormality, and this commonest type of high blood pressure is called essential hypertension. The cause of essential hypertension was a complete mystery until very recently, when considerable light was thrown on the causation of this disease. For years it has been recognized that high blood pressure usually accompanies serious damage to the kidney, such as that which ensues following repeated intections of the kidneys In 1934, Harry Goldblatt, working in the United States, went further along this line and showed that high blood pressure could be produced in animals by constricting the arteries to the kidneys by means of a clamp. The problem was approached from a different angle by Irvine H. Page, also in the United States, and simultaneously by a group of workers in Argentina all of whom arrived at a similar conclusion. This conclusion was that the kidneys of patients with high blood pressure secrete a substance called renin, which enters the blood stream, where it reacts with a substance present there and called renin activator. The combination of these two substances results in the formation of a third substance, called angiotonin, which is carried m the blood to all parts of the body and produces widespread constriction of blood vessels, which in turn causes an abnormal elevation of the blood pressure. It is considered that release of renin from the kidney into the blood may occur as the result of insufficient flow of blood into the kidney, such as that which Goldblatt produced in animals by pinching the arteries to the kidneys with clamps. It is thought that the kidney normally fails to secrete renin into the blood because the normal kidney contains a substance which inhibits or destroys renin. From this it might be inferred that extracts of normal kidneys might contain sufficient of this substance so that injections of such extracts would destroy the renin in the bodies of patients suffering from high blood pressure, and thus alleviate the condtion. This treatment has actually been tried, and seems to hold promise, although it is still in a very experimental stage. Since 1935 there has been tried a surgi-

cal treatment for high blood pressure which consists in intercupting the nerve supply to the kidney by means of any one of several different operations. The basis for this type of treatment consists in the fact that the flow of blood within the kidney is in some degree modified by nervous influences. It the nerve supply to the kidney is interrupted, the blood vessels in the kidney dilate so that more blood flows through it. It can be seen that this effect should tend to counteract the impairment of blood flow which is thought to be responsible for the high blood pressure. The value of this type of surgical treatment is still uncertain. It is agreed that it frequently produces a temporary alleviation of symptoms, but it appears doubtful that the high blood pressure can be permanently cured in this fashion.

Other Advances. Many other advances in medicine, if slightly less important than those already mentioned, are still of great interest and value. Brief mention is made of some

of the most interesting

The treatment of syphilis has advanced strikingly in two respects. Due to the introduction of a new arsencal drug, mapharsen, which is less toxic than the drugs used in the past, it is proving feasible to concentrate the treatment of early syphilis within a few months instead of having it extend over a year and a half or two years. Secondly, since about 1925 it has been proved that a prolonged course of high fever has a curative effect in the late type of syphilis called paresis, previously resistant to all other forms of treatment. It has been found convenient to give such a course of tever by moculating the patient with malaria, which can subsequently be readily cured with quintie.

In 1940 an explanation was found at one and the same time for the hitherto baffling leactions following blood transfusion and, more importantly, for the tendency of certain women habitually to miscarry or give buth to a child which dies during delivery or soon thereafter. It has been discovered that both of these difficulties are due to a factor present in the blood of most persons, called the Rh factor The reactions following blood transfusion result from the mixture of a donor's blood containing this factor with the blood of a recipient who lacks the factor. Similarly, if a woman who lacks the factor in her blood mairies a man who has the factor in his blood, the child conceived by their union will mherit blood containing the factor. While the child is in the womb, its blood mixes with that of the mother sufficiently so that a reaction between the two bloods occurs, causing a condition which is fatal to the child. Fortunately only about 15 per cent of persons lack the factor and possess

the ability to react against it

During World War II almost everyone became familiar with the fact that blood plasma, or blood from which the red cells have been removed, may be used in place of whole blood in the treatment of shock. Blood plasma has the advantage over whole blood that it may be kept for indefinite periods of time and also that it may be given to anyone without first making tests to determine whether the two bloods can be mixed without reaction in the recipient. On the other hand, plasma is of little use in the treatment of anemia since it does not contain any red blood cells.

The recognition of a number of new diseases constitutes a very important advance in medicine.

Perialteritis nodosa, acute disseminated lupus erythematosis, toxoplasmosis, coccidosis, palindromic iheimatism, infectious hepatitis, regional enteritis, are but a few of them. These may be only haffling names to the lay reader, but have provided an explanation for much that was mystigment to physical transfer or the provided and the provided

tifying to physicians

The past few decades have brought understanding of a large group of illnesses, called the Rickettsial diseases because they are due to a unique type of bacterium which was named after its discoverer, Howard T. Ricketts Typhus fever and Rocky Mountain spotted fever are the two best-known examples of this group. It is now known that these diseases are spread only through contact with some insect carrier, such as a tick or a louse. At present, no highly curative treatment for the Rickettsial diseases is recognized, but two chemicals, para-amino benzoic acid and methylene blue, each appear to hold considerable promise, and are under clinical tital. Furthermore, effective methods of vaccination against the Rickettsial diseases have been developed and its considerable and its constant of the constant of t licen developed, and it is proving possible to control them by measures directed against the insects which spread them. See also BACTERIA AND BACTERIOLOGY; BLOOD; IMMUNITY, PATHOLOGY; PENICILLIN; SALVARSAN AND NEOSALVARSAN; SULFA DRUGS; VITAMINS; also separate articles on the various diseases, and biographies of important men in the medical field.

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MEDICINE DANCE, a common practice among the American Indians, dances being conducted by the medicine men of the tribe for various purposes, and in preparation for different events, like warfare, and the hunt. Both in the dance before a battle and in the conflict itself the medicine chief is the one man most worthy of consideration. If war takes place, he courts the thick of the fight if for no other reason than to show his immunity from danger. The funeral dance of the Yaqui tribe is a representative example of the medicine dance; the chief medicine man arranging the ceremony, which ensures the safe passage of the dead to the spirit world. The dancers to the number of half a hundred appear in the center of the assembled tribal gathering, naked except for a cloth about the loins Their bodies are painted in imitation of skeletons. Over their heads they wear masks fringed with long horsehair, dyed in many hues, eyelashes and eyebrows hang over the rudely designed faces, and beards reach nearly to the waist. On their legs they fasten strings of rattles cut from rattlesnakes, and the sound of these is most gruesome to the spectators. Each dancer carries two knives, with which he gesticulates violently in imitation of the act of slaying imaginary enemies.

MEDICINE HAT, Canada, a city in the southeast corner of Alberta, 600 miles west of Winnipeg and 167 miles southeast of Calgary,

in lat. 50° 2′ N, and long 110° 40′ W, and is 2,181 feet above sea-level. It is situated on the slope of the South Saskatchewan River which gives it a drainage much superior to towns on the open prairie. The city took its rise in 1883 from the advent of the Canadian Pacific Railway. It is on the main line of the railway and is the terminus of the Crow's Nest Line. For many years it remained a centre for the cattle ranching industry for which the surrounding country was excellently suited, the chinook winds which prevail in this part of the country enabling the horse and cattle to range in the open throughout the winter as during the summer But the large ranches are rapidly disappearing as the land is being brought under cultivation by the homesteaders In 1899 Medicine Hat was incorporated as a town and in 1907 as a city. As its earlier development was due to ranching and then farming its late development is due to the rise of manufactures. Like Lethbridge it is one of the four principal coal mining centies of the province but its most valuable resource is gas. It lies in the centre of one of the largest fields of natural gas on the continent. The gas was first discovered about 1885 when the Canadian. Pacific Railway bored on the banks of the river to find coal deposits. The first gas well was drilled in 1890 by a company of local citizens For many years the gas was gradually developed for domestic consumers but from 1909 it has been more extensively developed as a cheap and excellent fuel for manufacturing purposes. There are several wells with an average daily open flow of two million cubic feet. This is distributed to domestic consumers and to manufacturers at a very low rate per 1,000 cubic feet. The city owns and operates its own utilities. The electric plant and the water plant are operated in conjunction, the same boilers producing the power for operating the pumps and the dynamos. The city water supply, taken from the Saskatchewan River, is passed through a sedimentation basin and filter beds and is pumped to a reservoir on a hill overlooking the city from which it is carried by gravity pressure. There is also a sanitary sewage system, the sewage being deposited in the river some distance below the city. The sticets are all 66 feet wide, are all macadamized and have been well planted with trees. There is a dry-farming demonstration farm, an airport sanctuary for storm-bound planes, a business college, general and isolation hospitals, a public library, nurses' home, large greenhouses, St. Theresa's Academy (Convent), and several hotels, banks, and churches. There are also flour, linsced-oil, 10lling malls a grain selector (convent) ing and planing mills, a grain elevator (capacity, 1,305,000 bushels), brick works, potteries, steel plant, lumber mills, glass works, foundries, and machine shops. There are large lignite coal deposits in the vicinity. Consult 'Place Names of Alberta,' published by Department of Interior (Ottawa 1028) Pop (1031) 10 300, (1036) 0.502 (Ottawa 1928). Pop. (1931) 10,300; (1936) 9,592.

MEDICINE MAN, among the American Indians, South Sea Island tribes and other savages, a man supposed to possess mysterious healing powers. Among most savages the medicine man occupies much the same position as that held in civilized communities by two of the learned professions—medical and clerical. The medicine man is both priest and physician,

and is at once the repository of all that a tribe knows, fears and believes In very low stages of human development, however, he is at best only a magician, dealing in terrors, possessed of occult powers, but laying claim to no special medical knowledge. Thus, among the aborigines of North Queensland, the tribal doctors do not attend on the sick for by wife or mother. They are not ostentafor by wife of mother they are not ostenta-tious, a medicine man being distinguished by no insignia save a small bag for his talismans, death chairs and other "credentials". Among the North American Indians medicine men are treated with great respect, and form a secret society with exclusive privileges and "exercise a terrible influence in degrading the people" It is curious to find that, as in Australia, the Indian medicine men are chiefly concerned to do positive harm. In co-operation with good and had spirits, they bring about the deaths of men or dogs at a distance. Among the Ojibways they are a kind of brokers in vengeance, and a coward or a hypocrite who wishes to be covertly avenged upon an enemy will bribe his tribal medicine man to employ the medical attendant of his victim. Then, if the victim dies, the instigators remain, unsuspected, and the actual perpetrator of the crime probably goes scot free Indian medicine men affect to suck out poison from a patient's body, or they cough up an arrow point or small, sharp piece of stone or bone which they suppose has been transferred from him to them by the evil spirit of another sorcerer. The medicine men of the Eskimos are even more extravagant in their pretensions. They profess themselves able to change into wood, stone or animal, or even to walk on the water, or to fly, but they make a condition, which is that "no one must see them." See Indians

MEDICINE AND PSYCHIATRY, Psychology in. Although the great power of suggestion has been recognized from the earliest human times and the powerful influence of the mind on the body somewhat understood for centuries, the medical schools obviously have in general belied their high privilege of first studying and then teaching the relations and mutual dependence of body and mind. They have neglected psychology. It has been a characteristic of modern scientific medicine that it has integrated inadequately, and therefore been unduly narrow (in this respect) in its range,- these two facts indeed being but natural results of the plain over-guidance by the tradition of materialism. And this is strange to the average man and unaccountable to a degree, for the best English and, to a less extent, French attitude was one of adequate and practical realization of the health's frequent dominance by the mind, and the width and depth and misunderstood complexity of the influence of that which we designate as mental John Locke influenced the experience of early English medicine more than did the materialist Thomas Hobbes; but America somehow narrowed if it did not "harden" its medical heart.

The practical result of this trend has been a regrettable, not to say surprising, slowness in medical education's recognition that the practitioner invariably should know the broader rudiments at least of psychology; have systematic, however brief, acquaintance with the founda-

tion-principles of the relation of body and mind; and above all be forced to realize, against the old traditional materialistic prejudice, that every patient is mind quite as importantly as body. Every reader knows this for lumself.

Because, in part, of his varied education, the present writer was almost a proneer in pracheal attempts to correct this particular narrowness of American medical education, although laboring meanwhile under quite characteristic difficulties, such as the tradition of the schools and lack of time and of tunds. To repeat part of an article which was published in Science,

several years ago.

The education given to the medical student seems in general too grossly materialistic, too somatic. He learns but one side of this twosided story; from the first year to the fourth, from the dissecting room to the gynecological or otological clime the routine student sees and hears of muscles and bones, and viscera, senseorgans, nerves and vital fluids, but little, unaccountably little, of that other aspect of men and women which to these very men and women is their life, while these other, these organs, are but needful instruments of that he's attainment And their point of view, it need not be said, is also that of philosophy; shift it, and illogical confusion follows layman cares little or nothing for his stomach's condition so long as it gives him no pain and takes good care of what his will and his appetite lead him to supply to it. The woman in search of a happy family life thinks seldom of her reproductive mechanism so long as it gives her healthy children whom she can love. There is something beside cell-built tissue for the gynecologist in charge of an operative case to consider when of two women, alike in vigor, who undergo identical ovariotomies, for example, one goes in three weeks from the hospital a new woman, cheerful, capable and happy, while the other becomes an hysteric wick never perhaps to equal her former self in happiness or in health. As every surgeon knows, such differences are met continually and they puzzle him. Why is it that present medical education takes no account of the principles underlying phenomena like this?

So far as the student is concerned, the course, four years or three years long, quite ignores in general the emotional and temperamental factors which in one way or another, directly or indirectly, less or more, enter into almost every chronic case and into many of the acute cases which the general practitioner is called upon to treat. Instead of striving to teach the student what conditions underlie mental habits and idiosynerasies, medical instructors are now content to practically ignore them regardless of possible great benefits to come from their study as psychological data.

Too often is the medical man the most materialistic-minded member of a community, when his view should be much deeper, into the controlling forces of life. This is the natural outcome when in a long medical course no part of the individual is shown to the student except what he can feel with his hands or see through the microscope. Yet how commonplace is the assertion that the man, the real man or woman, is not his or her body, but the will, affections, habits, character, of the individual, while (what is more immediate to our argu-

ment) these same aspects of consciousness are often the direct molders, or destroyers of discase and, as one side of an inseparable psychophysical organism, have more control or influonce over the functions purely somatic than the average practitioner of medicine appreciates. Not mind controlling body nor body controlling mind, but both together always sensitive to the stimuli of a common environment, combined into the actual individual.

The whole trend of modern biologic science is toward the appreciation that neither factor of personality, body or mind, in justice to the medical student and through him to the

public may be longer ignored

Agreeably to such convictions, the catalogue of the Tufts College Medical School of 1900-Ol contained announcement of a course in "Normal Medical Psychology" This was continued for nine years, when by arrangement with Prof Morton Prince, it was developed into a course termed "Psychopathology and Psychotherapeutics. In 1912 (for lack of funds to pay the lecturers) the psychological work was abandoned. Such a record of pioneer development in medical curriculum is instructive in several respects to all of those who believe that a physician should realize that his patients have minds influential to a degree at present quite indefinable but more and more appreciated. So far as known, the Johns Hopkins medical department alone preceded in the practical and systematic realization of this basal fact

The slowness with which adequate courses in normal medical psychology are made required parts of medical curricula, is another depressing sign of the essential narrowness of the average professional outlook into life and philosophy, just as it is another evidence that medicine is for some of its practitioners still largely a trade wherein no facts are either of interest or desirable, no breadth of view admittable, that has not a bank-note or its equivalent closely attached Hasten the progressive day when without the broadening education of the college bachelor's course at least no man or woman shall be allowed for gain to take charge of the human personality of a fellow mortal! For without his psychology he knows only about half of the being whom he pretends thoroughly

to understand.

The reasons in particular for this insistent need of psychology in medical education the writer already in part has summarized in an article in the New York Medical Record of 30 Jan., 1909.

The Physician's Need of Psychology.—

The most obvious and immediate need for systematic medical psychology comes, of course, from psychiatry and neurology. That the demand does not come even more insistently than it does from the teachers of these subjects, especially of the former, is one of the anomalies of the whole matter. When one does not expect a student to understand the deranged movements of the heart who has never seen a healthy heart or a representation of one, why should the multitude of third- and fourth-year men who know nothing of the processes of perception and imagination be expected to com-prehend an hallucination? Or those who have never been told of the mechanism of the emotion of fear to understand the depression and misery of melancholia? One asks too much in

expecting any man to really comprehend a case of paranoia who has no notion of the processes of ideation. And neurasthenia, the bread-and-butter malady to practitioners of nervous disease, does any suppose it is not so intertwined with mental relationships that to unravel it in full is to make use inevitably of no little various and intricate psychology? The modern variants of the "rest cure" require a knowledge of the motor relationships of the mind, and else this valuable system of retraining the mind back to health through controlled voluntary use of the muscles would lose much of its precision and basal usefulness

In a less technical way, perhaps, but quite as importantly in the long run, the surgeon as a surgeon needs to be familiar with mental processes. It is especially important that he should realize the often surprising life-lengthening support and stimulation, technically called dynamogeny, that belongs to the joyful emotions. Scarcely less useful oftentimes, explain it as one may, is the vitalizing influence of determination, of vigorously expressed will to thrive and to live Aristotle and John Hunter down to the latest of them all agree in admitting these facts, however the future science of normal medical psychology shall in detail interpret and explain them Does the sceptic (if such, perchance, persist into these "latter days") know of a single really great surgeon who does not inevitably inspire the almost perfect confidence of every patient under his care? Can the master-surgeon actually cut us up invariably so much better than his struggling neighbor in the next block uptown? Or is his far greater success due in part to his exaction of confidence in his knowledge of human nature as really it is - mind as well as body, - giving us confidence and so inspiring hope and all the guarding and reparative powers of pleasant and stimulating emotion? The physiology and psychology of this important influence we now fairly well understand.

In a still more general way, the successful practitioner in medical cases as distinct from surgical, consciously or otherwise, uses the principles of psychology in a very large proportion of his practice. One need not attempt the laborious task of specification here, for every practitioner must nowadays realize to some extent the mental factors in every complex disease.

The Need of Psychological Instruction for Breadth.—In all departments of the science of medicine there is always an urgent demand for a broader outlook than the average medical student can obtain without a preliminary college course. It is easy to underestimate the influence and the importance to human-

ity of the profession of medicine

Medical philosophy reaches out into almost every aspect of human relationship, and thus it pervades, and in considerable part directs, every phase of modern human society. That it does not do so to even a greater extent than it does is largely because the nature of personality is not adequately studied in the medical school. Many phases of the individual are often exhaustively considered, but at present it is no one's business to combine these scattered parts into the wholeness of the individual child or man or woman And yet every patient is an individual, a personality, and has a heart

and kidneys and nervous system and all the rest only as parts ministering to this personality It is one of the important tasks of the medical psychologist to weave these scattered threads of organic knowledge into this actual personality. Then at last the average physician will know, in some measure at least, how to follow the sound advice of the numerous orators at commencement who advise the graduates "to treat not the disease but the individual suffering from the disease." The somatic aspects of the man are adequately treated in many, and perhaps in most essential, respects, but of the inner side of the "arc of personality" one hears but little as yet from the teaching faculties of medicine. The tide, however, is coming in

The psychology of sex is a phase of education for which there is continually a more obvious demand from a grossly wronged and degraded society, and consequently from edu-

cators.

The course in legal medicine in the medical schools demands for its greatest usefulness the basis of psychological knowledge which should precede it in the curriculum. Human misery and crime often depend on motives more psych-

real than physiologic

Psychology's Influence on the Physician Personally. Medical instruction in psychology undoubtedly would make the physician more sympathetic with his patients than sometimes he now is. With this added sympathy he would serve them better because more understandingly. He would tend to approach then the ideal of the oldtime family practitioner, "guide, philosopher and friend". Knowledge of the processes and relations of mind would be to the physician himself a source of great and unending satisfaction. Related to it is not only the knowledge of human mature, that never tiring source of interest and delight, but psychology leads outward in all directions into the true wisdom of divine philosophy.

In 1913 the American Psychological Association, by a committee, investigated the status of psychology in American medical schools. One of the questions asked the deans related to the advisability of special instruction in psychology. Of the 71 schools (only 71) answering this question, 73 per cent replied in the affirmative, 12 per cent in the negative, while 15 per cent gave a qualified answer one way or the other. How slow is the recognition that

emotions and ideas control the body!

Psychology in Relation to Psychiatry.—
It is obvious that the medical care of insanity cases, if more than "asylum" is to be offered these "tunhappy" souls, must depend as much on the physician's knowledge of psychology as on somatic medicine. At present it is in a widespread area of our country nothing less than a reproach that so few professional psychologists are trying to relieve and to cure the insane. In every case, from the irrational paranoiac to the terminal dement, much knowledge of the normal mind would seem to be a not wholly unreasonable requirement in an attending physician! As yet the percentage who have such knowledge is so small as to constitute a reproach to organized medical efficiency and nothing less than that. Even the superintendents of these institutions conducted for the cure or the care of diseased minds are seldom or never psychologists. And still many

of the hospitals have no such modern improvement about the place

Georgie Van Ness Dearborn, Medual Corps, United States Army

MEDICINES. See CHEMISTRY, PROGRESS

OF

MEDICK, a plant genus of the natural order Legummose, native of the temperate and warm belts of the Old World. The pods have spiral twists and the genus includes very many species, both annual and perennial, with tiffoliate leaves closely resembling the clovers species have been introduced into the United States, of which lucerne and alfalfa are economically the most important Several Russian species which require little moisture have recently been introduced in the and and semiarid regions of the West and have been proved a success See Medicago, and consult Bulletin 108) of the Texas Agricultural Experiment Station (1908) and Bulletin 105 of the Alabama Agricultural Experiment Station (1912).

MEDILL, më dil', Joseph, American journalist b New Brunswick, Canada, 6 April 1823; d. San Antonio, Tex., 16 March 1899 Having early removed to Massillon, Stark County, Ohio, he was admitted to the bar in 1816, practised at New Philadelphia, and in 1849-51 published at Coshocton the Republican, a Free-Soil paper. In 1852 he established at Cleveland the Forest City, a Whig organ, which in 1853 was united with the Free Democrat and called the Leader. In 1855 he sold his interest in the Leader, removed to Chicago, with two partners purchased the Tribune, advocated radical anti-slavery measures and supported Lincoln in 1860. He was a member of the Illinois constitutional convention of 1870; United States civil service commissioner in 1871 and in that year was elected mayor of Chicago. In 1874 became editor-in-chief of the Chicago Tribune, in which relation he remained until his death. It was relation he remained until his death. It was largely due to his individual efforts that the city of Chicago was selected for the World's Fair of 1893.

MEDINA, José Maria, hō-sā' ma-rē'ā mā-dē'nā, Central American politician: b. Honduras, about 1815; d Santa Rosa, 8 Feb 1878. He was president of Honduras in 1862-63 and was re-elected in 1864-66 and in 1870. The war with Salvador in 1871 disturbed his hitherto successful administration and at the next election he was defeated by the Liberal party who elected their candidate Arias. Defeated agam by Leiva in 1874 Medina raised an unsuccessful revolt in 1875-76 and in 1877 a second revolt was punished with death by court-martial

MEDINA, José Toribio, Chilean bibliographer: b. Santiago de Chile, 1852. He received his education at the National Institute and the University of Santiago, being graduated in law at the latter institution in 1873. At the age of 22 he was appointed secretary of legation at Lima. In that city he made investigations in the archives and in 1878 after his return to Chile he published a history of Chilean literature. Already in 1874 he had published a metrical translation of Longfellow's 'Evangeline' In the war with Peru, Medina served in the army and at the close of the war was made judge in the provinces ceded by Peru He was made secretary of legation at Madrid in 1884 and here also he delved into the Spanish ar-

chives dealing with the Spanish in America and especially the history of Chile He returned to his native country after several years' residence in Europe. He went abroad again in 1902 and also visited the United States to make further historical studies Medina's great work is the Biblioteca hispano-americana, 1493-1810) vols, 1898-1907), which contains notices of 10,000 works. Other bibliographical works are 'Historia y bibliografia de la imprenta en el antiguo virreinato del río de la Plata, (1892); 'La imprenta en Manila desde sus origenes hasta 1810' (1896), 'Biblioteca hispano-americana septentrional' (1897); 'Biblioteca hispano-chilena, 1523-1817' (3 vols, 1897-99); 'La imprenta en Bogotá, 1739-1821' (1904); 'La imprenta en Guideliore de Márico 1703-1821' pienta en Guadalajara de México, 1793-1821) (1904); La (1910); (1910); 'La imprenta en Guatemala, 1660-(1907), La imprenta en Guatemaia, 1000-1821) (1910); La imprenta en la Habana, 1707-1810 (1904); La imprenta en Lima, 1584-1824 (4 vols, 1904-07); La imprenta en México (1907—); La imprenta en puebla de los Angeles, 1640-1821 (1908); etc, etc. Medina's historical works are also important since they are based on manuscript sources. They include 'Historia de la Inquisición en Lima' (1887); 'El Tribunal del Santo Oficio de la Inquisición en Chile' (2 vols., 1890); 'Juan Diaz de Solis' (2 vols., 1897); 'La Inquisición en las Islas Filipinas' (1899); 'La Inquisición en México' (1905); 'El Portugués Estebán Gomez' (1908); 'El Portugués Estebán Gomez' (1908); 'Medallas coloniales hispano-americanas' (1900); 'La instrucción pública en Chile' (2 vols., 1905); 'Diccionario biografico colonial de Chile' (1906). He edited 30 volumes of 'Colección de documentos inedithey are based on manuscript sources. They in-30 volumes of 'Colección de documentos ineditos para la historia de Chile' Consult Chiappa, V. M, 'Noticias acerca de la vida y obras de Don José Toribio Medina' (Santiago 1907).

MEDINA, or MEDINEH, me-de'na, Arabia, the native Medinah-al-Nabi or City of the Prophet (also Medinat Rasul Allah, City of the Apostle of God), 500 miles southeast of Palestine, 250 miles north of Mecca and about 110 miles east of Yembu on the Red Sea. It is reached from Damascus by an 820-mile railway journey. The city is celebrated for containing the tomb of Mohammed, whence it ranks second to Mecca as a pilgrimage resort of Islam. It is situated in the most feitile spot of all Hejaz, the streams of the vicinity tending to converge in this locality An immense plain extends south from it; in every direction the view is bounded by hills and mountains. The town forms an oval, surrounded by a strong stone wall, 30 to 40 feet high, that dates from the 12th century, and is flanked with towers, while on a rock, at its northwest side, stands the castle. Of its four gates, the east Bab-el-Misri, or Egyptian gate, is remarkable for its beauty. Medina has no large buildings except the great mosque, two smaller ones, a college and public baths. The houses are of stone, two stories high Beyond the walls of the city, west and south, are suburbs consisting of low houses, yards, gardens and plantations. These suburbs have also their walls and gates. The mosque of the Prophet stands at the east side of the city and resembles that at Mecca on a smaller scale Its court is almost 500 feet in length, the dome is high and the three minarets pic-The tomb of the Prophet, who died turesque. and was buried here in 632, is enclosed with a

screen of iron filigree, at the south side of which the pilgrim goes through his devotions, for all of which he pays, but is consoled with the assurance that one prayer here is as good as a thousand elsewhere. The tombs of Fatima (Mohammed's daughter) and Abu Bekr (father of his wife Ayesha), and of Omar, the first calif, are also here The mosque dates from the period of Mohammed, but has been twice burned and reconstructed. Omar and Omar and Othman both enlarged the original simple brick structure It was again enlarged by the Calif Walid, so that it enclosed the three tombs. It was destroyed by lightning, probably about 850, and the graves almost forgotten In 892 the place was cleared up, the tombs located and a fine mosque built, which was destroyed by fire in 1257 and almost immediately rebuilt. It was restored by Khaid Bey, the Egyptian ruler, in 1487. It is estimated that one-third of the pilgrims to Mecca go on to Medina, the pilgrimage to which may be performed at any time of the year. In the time of Ptolemy the town was known as Lathrippa. There never was much population until the place acquired fame as a resort for pilgrims. The city has been built up by acquisitions from visiting pilgrims, who recognized the opportunities tor making money here by catering to visitors. For this reason the local people are heterogeneous and stand for nothing but keeping up the crowd of pilgrims. Since 1814 Medina has been the capital of the north pashalic of Atabia. Pop. 40,000 In June 1916 the Grand Shereef of Mecca proclaimed his independence of Turkey. Mecca thus, with the founding of the new kingdom of Hejaz, was lost to the Turks; Medina held out, however, until 13 Jan 1919, when the Turkish garrison under Fakhri Pasha surrendered to the Emir Abdullah, the representative of King Hussein of Hejaz. Consult Burton, Sir Richard Francis, 'The Pilgrimage to Al-Medinah and Meccah' (London 1855). See Mohammed.

MEDINA, me-di'na, N. Y., village in Orleans County; alt. 530 feet; on the New York Central Railroad; 41m W. of Rochester It is on the line of the old Eric Canal, now the New York State Barge Canal Surrounding the village is a fertile agricultural area, producing field crops and fruits, especially grapes and apples. Like most towns in this region, Medina has the canning of fruits and vegetables as a basic, though seasonal, industry. More stable employment is provided by furniture and textile factories, foundries, and machine shops. Many of the buildings in the village are red sandstone which was quarried in the vicinity from the early days of settlement until late 19th century. There is a public library. Medina was first settled in 1803 and incorporated in 1832 Its government is administered by a mayor and council. The water supply system is municipally owned. The electric power and light are purchased from a private company. Pop. (1930) 6,071; (1940) 5,871.

MEDINA, Ohio, village and Mcdina County seat, alt. 1,086 feet, on the Baltimore and Ohio and the Northern Ohio railroads, 21m. W. of Akron; has an airport It produces furnaces, pickles and relishes, and honeylee supplies. There is a public library. The government is by mayor and council. Pop. (1930) 4,071; (1940) 4,359.

MEDINA SERIES, in geology, a term introdunced by the New York Geological Survey for a subdivision of the Upper Silurian series, apparently the base of that system. It is named from Medina, N. Y., occurs throughout the Atlantic States; and includes shales, conglomerates and sandstones. For the Medina sandstone see Levant

MEDINA SIDONIA, mā-dē'na sē-dō'nē-a, Spam, a city in the province of Cadiz, 20 miles southeast of Cadiz and 55 miles northwest of Gibraltar, built in the form of an amphitheatre on a broad eminence, in the middle of an extensive plain, noted for its agricultural products and cattle rearing, which constitute the chief occupations of the population. A fine Gothic church, a town half and the ancestral palace of the famous dukes of Medina Sidonia are the principal buildings. Pop. about 11,000.

MEDINET EL FAYUM, Egypt, capital of the province of Fayum, on the Balit-Yusuf, 155 miles south of Carro. It contains a fine bazar and a mosque. It has an extensive trade in gram, woolens and roses. Woolens are manufactured. An American mission is established here. Pop. 37,320.

MEDITATIONS \mathbf{OF} LAMARTINE The 'Méditations' (1820) and 'Nouvelles Méditations' (1823) of Lamattine should be counted rather as heralds of the Romantic School of French poetry than as products of it. The former, its author's first publication—he was then 30 - appeared five years after Waterloo Its sentimentalized melancholy voiced so admirably the temper of that period of political reaction and moral exhaustion that it achieved a success in its day hardly paralleled. Its appeal was to the cultured only, but 40,000 copies of the 'Méditations' were sold in four months, The modern reader must strive to realize the temper of 1820 if he would comprehend how these rather thin and always superficial reflections on the relations of man to "Nature"-a creation of the poet's morbidity, with little relation to reality rather than to his fellowmen, found admiration so ardent, that successive volumes of verses, in his own phrase, "fell from my pen like drops of evening dew," while the poet found himself "incapable of the exacting labor of the file and of criticism." "The soul of the poet." he want in the poet." of the poet," he writes in a volume of 'Confidences,' "is a running brook which writes its mumus and sings them, but we write them with human notes and Nature with the notes of God.»

The 'Méditations' were the work of an army officer, but it was the army of the Restoration, more responsive to Rousseau's call for a return to nature and to Chalcaubriand's for a return to religious emotionalism than it was to any summons to action. When that mood passed and France recovered the energy that showed itself in politics by the Revolution of 1830 and in literature by the Romantic School, the 'Méditations' soon came to be little read, though still conventionally admired. Unquestionably, however, they were the most complete literary reflection of the sentiments and aspirations, the self-deceptions and illusions of the generation of 1820. This gives them a lasting value, greater than their merit of content or of form.

Lamartine's verses preserve much of the

verbal mannerisms of the earlier period. They are harmonious, refined, delicate, graceful, sin-cere, spontaneous, "the indolent pleasure of a too-richly gifted mind". On the other side they are conventional in expression, monotonous in feeling, clusive in development themes are throughout those of the true lyric -- nature, love, death The essence of all Lamartine's voluminous poetic effusion can be seen of the 'Méditations,' for instance, in The Lake (Le Lac), accounted by some to be Lamartine's best poem, in Loneliness (L'Isolement), and in the vacue partherstic melancholy of Prayer (La Prière). In the Nouvelles Méditations, the poet's congenial mairiage is reflected in the happier vein of the Love Song (Chant d'Amour), Wisdom (La Sagesse), Is-chia and The Preludes (Les Préludes), but the poet soon resumes the melancholy pose. The Ode on Bonaparte in this collection goes deeper and uses higher than is usual in La-martine; as indeed there is unwonted grace in Ischia and force in The Crucifix Never so popular as the earlier book, 'Nouvelles Méditations' are preferred by many critics, and Brunetière even pronounced them "at once the noblest and the most voluptueur in French poetry" It is juster to say, with Lanson, that if, and so far as, poetry is essentially sentiment, disengaged from the ideas and facts that produce or accompany sentiment, the 'Méditations' are great poetry and Lamartine is among the most poetic of poets Consult Life of Lamartine by H. R. Whitehouse (New York 1919).

BENJAMIN W. WELLS,
Author of Modern French Literature.

MEDITATIONS OF MARCUS AURELIUS, The. There is probably no more iomantic story of a book in the history of literature than that of the volume known as the 'Meditations of Marcus Aurelius' merely the commonplace book or diary of a Roman emperor (121 180 AD), who at the end of a very busy and troublous reign, just when worries were thickest, jotted down all the serious thoughts that came to him with regard to the meaning of life and the way it should be lived. He called his little book simply "To Himself" It was probably meant only for his own perusal when he was in meditative mood He so loved the Greek Store philosophers whose writings had been his inspiration and consolation that he wrote in Greek. It is not good Greek any more than the 'Imitation of Christ' is good Latin. He paid little attention to the style of it, and yet Headmaster Rendall of Charterhouse in his Introduction to the 'Meditations' does not hesitate to say that "in the whole range of Greek literature, no work (excepting the New Testament) has wider vogue and currency than these untutored meditations of the imperial moralist.»

The book created a furore in the Renaissance when it was first edited and printed, but it has never ceased to be the favorite reading of thoughtful scholars. John Stuart Mill de-clared the 'Meditations' as "almost equal in ethical elevation to the Sermon on the Mount." Matthew Arnold went so far as to say that "Marcus Aurelius remains the especial friend and comforter of all clearheaded and scrupulous, yet pure hearted and upward striving men

in those ages most especially that walk by sight, not by faith, but yet have no open vision. Americans will be interested to know that the 'Meditations' of Marcus Aurelius were with Machiavelli's 'Art of War' the daily study of Capt John Smith, the Virginia pioneer whose romantic history might seem to indicate some less stein and stoic reading. The Roman emperor's little book has often since been the daily resource or even the boon companion of men of action in the field as well as of statesmen worried over matters of politics, and of scholars with time on their hands

It has been suggested that perhaps this last of those Spanish Cæsars, under whose rule for 80 years Gibbon thinks that the world was happier than it has ever been before or since, had the idea while he was jotting down these scattered thoughts on life that some time or other they might be of service to his son Commodus. If that were so, the book might serve as the contrast to Chesterfield's letters. The modern English nobleman wrote an epitome of worldliness; the ancient emperor a manual of other-worldliness. But if Marcus Aurelius wrote for the eye for his son, he was sadly disappointed, for Commodus was probably one of the worst rulers of history. For his weak selfishness no

advice would have availed

The 12 books treat of: I, The debts that he owes for all that has come to him in life—(here are tributes to his grandfather—his father died when he was very young - to his wife "so used when he was very young—to his wife "so docile, so affectionate, so simple," and to many dear friends); II, On doing what you do; III, That to obey God is liberty; IV, That there is no such thing as chance; V, On the real goods of life; VI, That the inner life is all that counts; VII, On repressing impulse and finding self-content; VIII, On equanimity; IX, Fate leads the willing man, but drags the unwilling: X, Look around you look behind you willing; X, Look around you, look behind you, look ahead of you; XI, Unselfishness; XII, (In conclusion) "Depart then satisfied for he who also releases thee is satisfied.»

When the Emperor Julian whom the modern world knows as the Apostate would sum up the life of Marcus Aurelius in a single phrase he gave an excerpt from a dialogue supposed to take place not long before his predecessor's death: "Then Hermes, looking at Marcus, said, 'And to you, Verus [Marcus' family name], what seemed the publish end of life?' Quietly what seemed the noblest end of life?

what seemed the noblest end of life? Quietly and gravely he replied, 'The imitation of God' 'D' Consult Watson, 'Life of Marcus Aurelius' (New York 1884); 'Marcus Aurelius,' in Matthew Arnold's 'Essays in Criticism'; Rendall, 'Marcus Aurelius Antoninus' (London 1901); Long, 'The Meditations of the Emperor Marcus Aurelius Antoninus' (London 1862); Canon Farrar, 'Marcus Aurelius,' in 'Seekers After God.

JAMES J. WALSH.

MEDITERRANEAN (med"i-te-rā'ne-an) SEA, the great inland sea between the continents of Europe, Africa and Asia, the remnant—according to Professor Suess—"of a great ocean which at an early geological epoch, before the formation of the Atlantic, encircled half the globe along a line of latitude. From its castern extremity in Syria to the Strait of Gibraltar it is about 2,300 miles long; its maximum width from Venice to the Bay of Sidra

is 1,200 miles; its average width 300 miles. Its area is variously estimated as from 815,000 square miles to 1,145,000 square miles. The shores of Europe are on the north and northwest, those of Africa on the south and those of Asia on the east. The Mediterranean is connected with the Atlantic by the Strait of Gilbraltar, and on the northeast with the Black Sea through the Dardanelles, Sea of Marmora and the Bosphorus, which form a continuous waterway. It is integular in shape and by the projection of the south part of Italy, and of Cape Bon in Africa and the interposition of the island of Sicily, is divided, near its centre, into two distinct portions, an east and a west. In addition to these, the other important subdivisions are the Tyrrhenian or Tuscan Sea, between the west coast of Italy and the islands of Sardinia and Corsica; the Adriatic Sea or Gult of Venice, between the east coast of Italy and the west coast of Yugoslavia and Albania; the Ionian Sea, between the west coasts of Albania and Greece, and the south part of Italy and the island of Scaller the Agree County and the island of Sicily; the Aegean Sea or Archipelago, between Greece on the west and Turkey in Asia on the east; and the Levant, which is usually understood to include the whole sea east of the island of Crete The largest gulfs are, on the shores of Europe, those of Lion or Lyons, Genoa, Taranto, Lepanto, Koron, Kolokythia and Salonica; on the shores of Asia, Adrymiti, Smyrna, Adalia, and Skanderoon, and on the shores of Africa, Sidra and Cabes. The largest and most important islands are Sicily, Sardinia, Corsica and the Balearic Isles, in the west division, and Cyprus, Rhodes, Crete, the Ioman Isles and Malta, in the east division. The principal rivers which discharge themselves into the Mediterranean are the Ebro, Rhone, Po and Nile, but its communication with the Black Sea entitles it to claim it as part of its basin, and, consequently, also the great rivers Don, Dnieper, Dniester and Danube. Between Cape Bon and the Sicilian coast, where the sea is shallowest, the depth varies from 30 to 250 fathoms, but in almost all other places, particularly at a distance from the shores and islands, the depth is very much greater, the maximum depth in the eastern division being 2,150 fathoms, in the western division, 2,040 fathoms. The mean depth is practically equal in the east and west divisions, about 883 fathoms. However, half the area is less than 500 fathoms deep. The depth temperatures are very much warmer than in the Atlantic. Owing to the very narrow channel which connects the Mediterranean with the main ocean, there is very little tide; though in some places, as in the Ionian Sea, the Adriatic, on parts of the African coast, etc., a rise of more than six feet sometimes occurs The prevailing winds are the southeast and southwest in spring, and the northeast and northwest during the test of the year. They often rise suddenly and with great violence. The most remarkable are the historic Euroclydon or Levanter, mentioned in Acts 27 14, a northeast wind of dangerous whirlwind characteristics; the Bora in the Adriatic; the Etesian and Tramantona in the Aegean; and the burning sirocco from the African desert. The Mediterranean abounds with fish, some 400 species having been noted, and also furnishes the finest coral and sponge.

evidences of volcane action along its shores are present in the active volcanoes of Vesuvius, Etna and Stromboli (qq v) Consult Cook, J., The Mediterranean and Its Borderlands (Philadelphia 1910).

MEDITERRANEAN SUBREGION, a subdivision of the Palacaretic region, embracing the basin of the Mediterranean and the plans of Syria See Zoogfography

MEDIUM, THE, a two-act opera by Gian-Carlo Menotti (qv.); libretto by the composer. First produced at the Brander Matthews Hall of Columbia University, New York, May 8, 1946. In the following February it was given three performances by the Ballet Theatre at The Heckscher Theatre in New York, together with the prennere performances of Menotit's The Telephone (q.v.) Commencing May 1, 1947 the two operas were produced under commercial sponsorship at The Barrymore Theatre in New York, and continued for several months consecutive run of nightly performances

Both acts take place in Madame Flora's parlor, in contemporary times Madame Flora is a traudulent medium who uses her daughter Monica, and the deaf mute Toby, as confederates Toby is deeply in love with Monica, In the midst of a séance Madame Flora feels a cold hand about her throat. She is so frightened that she exposes her tricks to her clients, Mr and Mrs. Gobmeau and Mrs. Nolan. The clients refuse to be undeceived, but Madame Flora cannot believe that the hand on her throat was a supernatural phenomenon She insists that Toby was trying to kill her. She threatens the boy and beats him, and in spite of Monica's pleadings, turns him out of the house. Madame Flora starts drinking and becomes so drunk that she sinks into a stupor. Toby returns, trying to find Monica. Madame Flora revives and Toby hides in the cabnet. In a panic Madame Flora takes her revolver and shoots at the curtains of her cabinet. Toby's body falls to the floor.

MEDJIDIEH. See Orders and Decorations—Turkish.

MEDLAR, a small tree (Mespilus germanica) of the apple family Although a native of southern Europe, it is also grown in America In central New York it is hardy and produces well with no special care. The top-shaped fruit, which is about the size of a small pear, is used for preserves.

MEDOC, mâ-dôk', a wine which derives its name from a district of France, in the ancient province of Gascony. It is dry, still and delicate, resembling Bordeaux wines, which territory is immediately south of Medoc.

MEDULLA OBLONGATA, the brainstem, or that part of the nervous system that lies between the pons, or pons Varolii, at the upper end, and the spinal cord proper, with which it is continuous, at its lower end. It is a very old part of the nervous system, judged from the standpoint of evolution, and in it are located the important centers of most of the cranial nerves, including the centers that govern the nerves of the heart and of respiration. It

is a triangular cone-like portion of the nerveaxis, about an inch in length and one-half to three-quarters of an inch thick, being tubular below and flattened above Below, it closely resembles the cervical cord in its internal construction, but above great changes take place to accommodate important new structures. One of the most conspicuous features of the medulla consists in a triangular enlargement of the central canal of the cerebio-spinal axis, constituting what is known as the fourth ventricle. The lower seven cramal nerves have then apparent origin in the medulla, and the first spinal nerve also originates in the medulla proper The internal anatomy of the medulla is complicated At the lower end the chief motor tracts, the pyramidal tracts that come from the motor area (qv) in the brain cross one another to pass down on opposite sides of the spinal cord It is because of this decussation that a hemorrhage of the brain of the right side causes a paralysis of the muscles of the left side of the body, and vice versa Just above the decussation of the pyramids the end-stations (nuclei) of the two chief sensory tracts of the body are located. It is into these nuclei - the gracilis and the cuneatus --- that all of the sense-impressions from the body below the head are collected, to be passed to higher cerebral centres through the lemniscus or sensory fillet. The chief gray masses in this part of the brain are the nuclei of the cranial nerves referred to, and of the olives, two structures of undetermined function. The best description of the oblongata at present is that of the model of the medulla and pons by Dr. Florence Sabin, which is figured in Barker's 'Nervous System' Consult also Buck, 'Reference Handbook of the Medical Sciences,' article "Brain," and Johns Hopkins Hospital Reports, Welch Memorial Volume. See Brain

MEDUM, Egypt, village on the Nile, 40 miles south of Cairo, near the Pyramid of Snefru See Pyramid

MEDUSA, me-doo'sa. See Gorgo

MEDUSA, a disk-bearing jellyfish (q v.).

MEDWAY, England, a river which rises in the county of Sussex and flows northeast in a winding course across Kent, past Tunbridge and Maidstone, to Rochester and Chatham. Below Chatham it spreads out into a broad tidal estuary, in which are several islets, and joins the Thames at Sheerness It is 70 miles long and is navigable to Penshurst, 20 miles above Chatham.

MEEHAN, me'an, Thomas, American botanist: b. Potter's Bar, near London, England, 21 March 1826; d. Philadelphia, 19 Nov. 1901 From his father, a gardener, he learned facts of natural history when a child; at eight made and recorded an original discovery in herpetology; taught himself from books read at night after daily tasks; at 12 began to publish scientific papers; soon after produced the first hybrid fuchsia; and was nominated to membership in the Royal Wernerian Society. For two years he held a position at Kew Gardens. In 1848 he came to America and took charge of Bartram's Gardens in Philadelphia. In 1854 he established the Germantown Nurseries, which he conducted until the end of his life For 30 years (1859-89) he edited the Gardeners'

Monthly, and contributed papers to many other periodicals and to scientific societies. For 23 years he was senior vice-president of the Phila-delphia Academy of Natural Sciences, in whose proceedings were published his important 'Contributions to the Life History of Plants.' In 1875 he was elected a fellow of the American Academy for the Advancement of Science, before which, among other noteworthy papers, he read 'A Contribution to the Doctrine of Evolution and the Theory of Natural Selection,' which showed him as a coworker with Darwin and other evolutionary scientists, in whose field he also was a discoverer From the creation of the office until his death he served as State botanist of Pennsylvania, at one time was a member of the board of visitors of Harvard, and was one of the American editors of the 'Encyclopædia Britannica.' His travels and researches extended throughout the country, including Alaska. In 1878 he began the publication of 'Native Flowers and Ferns of the United States,' an illustrated serial covering a wide field of floral distribution, the main leatures of which he continued in Meehan's Monthly, founded in 1891 Many learned societies abroad enrolled him, and he held intimate relations with nearly all the leading scientists of his time Among his closest friends was the Comte de Paris, a devotee of plant-study. Meehan was the third American to receive the Veitch medal, awarded to him for "distinguished services in botany and horti-culture." Apart from scientific work he devoted himself to public labors; was a member of the Philadelphia common councils from 1882 until his death; during the same period served on the local school board; in both capacities intioduced many reforms; and chiefly through his efforts nearly 30 small parks were added to the city. A work of permanent value is his 'American Hand-book of Ornamental Trees'

MEEK, mēk, Alexander Beaufort, American jurist: b Columbia, S. C, 17 July 1814; d. Columbus, Miss, 30 Nov. 1865. He was graduated from the University of Alabama in 1833 and admitted to the bar two years after. He served in the Seminole War 1836; was attorney-general of Alabama 1836; judge of Tuscaloosa County 1842-44; and member of the legislature in 1853. While there he established the free-school system of Alabama In addition to a legal digest (1842) he wrote: 'The Red Eagle' (1855); 'Songs and Poems of the South' (1857); 'Romantic Passages in Southwestern History' (1857), etc. His best-known poem is 'The Charge at Balaklava.'

MEEK, Fielding Bradford, American palæontologist: b Madison, Ind, 10 Dec. 1817; d. Washington, D. C., 28 Dec. 1876 His educational advantages were limited, but his interest in natural history made study imperative to him, and in 1848 he became assistant to David D. Owen in a geological survey of Iowa, Minnesota and Wisconsin. He assisted James Hall at Albany in 1852-58, spending several summers in a geological survey of Missouri and Nebraska, and in 1858 went to Washington, where he devoted the remainder of his life to palæontologic investigations under the government. He was elected in 1870 to the National Academy of Sciences, and was a member of

other scientific organizations. Among his writings are 'Check List of the Invertebrate Fossils of North America' (1804); 'Report on Invertebrate Cretaceous and Tertiary Fossils' (1876), etc. For a complete list of his works, see hibliography published by the Smithsoman Institution

MEEKER, Royal, American statistician: b Silver Lake, Susquehanna County, Pa, 23 Feb. 1873 In 1898 he was graduated at lowa State College and in 1906 took the degree of D.Ph at Columbia University He also studied at Leipzig In 1904-05 he was professor of history, politics and economics at Ursinus College, Collegeville, Pa In 1905 he became preceptor at Princeton and from 1908 to 1913 was assistant professor of political economy there. On 12 Aug. 1913 Dr Meeker was appointed commissioner of labor statistics by President Wilson. In 1926-27 he was professor of economics, Carleton College, Minn He published (History and Theory of Shipping Subsidies) (1905).

MEEKINS, Lynn Roby, American journalist. b Salem, Md, 14 Nov 1802, d. 8 Nov 1933. He was graduated from Western Maryland College, Westminster, Md, in 1882, and devoted himself to journalism. He was literary editor of the Baltimore American 1882–99; managing editor, Saturday Evening Post, 1899–1901; editor, Baltimore Iterald, 1903–06, editor, Baltimore Star, 1908–11; on editorial staffs News and American, Baltimore after 1920. He published 'Robb's Island Wreck'; 'Adam Rush,' etc.

MEERANE, Saxony, town, 10 miles north of Zwickau and 36 miles south of Leipzig. It contains a mediæval church. Meerane is one of the largest textile-producing centres of the state, turning out vast quantities of woolen and mixed cloths. It has also extensive dyeing establishments, machine works, tameries, boiler works, motor factories, button, paper box and cement works. The town has a Realschule, a textile school and a school of commerce. Pop 24,094. Consult Leopold, 'Chronik und Beschreibung der Fabrik-und Handelstadt Meerane' (1863).

MEERKAT. See SURICATE.

MEERSCHAUM (Sepiolite), mēr'shâm or -shum, a name given to one of the silicates of magnesium; it is a mineral of a whitish or creamy color, and received its name from its appearance and the position in which it is sometimes found suggesting that it was petified foam of the sea. It is obtained from various places, but the best quality comes from Asia Minor, rich deposits of it existing about 20 miles southeast of Eskichehir, at a place called Sepetdje. Here are some 20,000 pits in a space of six miles, of which only 150 are worked, all the others being exhausted It is said that these mines were opened 1,000 years ago, which is not incredible, as it is well known that magnesia was formerly used for many purposes, other than the fabrication of pipes; moreover, fuller's earth was once worked on a vast scale by the ancients. The meerschaum mines are worked ancients. by some 500 miners, who live in the surrounding villages. At Gheikli, in the neighborhood of Sepetdje, there are 3,000 pits, of which only 100 are worked, giving employment to 400 miners. The mineral is mined in blocks, which are taken to Eskichehit, where the blocks are cleaned, the operation consisting of scraping and cutting the blocks with a sharp instrument or knile, the meerschaum being still soft and easily cut into any shape or form Over 1,100 persons are occupied in cleaning and shaping these blocks, which, after being thoroughly cleaned, are separated into four classes, according to size and quality. These blocks being ready for sale, a bargam is struck between the pipe manufacturers and the commission agents and merchants at Eskichehu, of whom there are about a dozen. The latter then pack the blocks of these four classes with very great care into boxes of equal size, each block being wrapped in cotton to avoid any friction or shock between the pieces. The actual annual output of these mines varies from 120 to 150 tons. It is soft when dug up, but becomes hard when dry Most of it is sent to Vienna, where it is chiefly made into tobacco-pines, many of them highly aitistic Similar pipes are also made in Paris, London and elsewhere.

MEERUT, India, the capital of the district and division of the same name, in the United Provinces, situated 40 miles northeast of Delhi on the Northwestern Railway. The city is irregularly bull, with narrow, filthy streets. It contains several mosques, a fine town hall, a college, normal school and church schools. At Meerit is one of the largest cantonnents in India Flour and soap are the principal manufactures. The first outbreak of the Indian Mutiny of 1857 occurred at Meerit, The city has a good water supply and an excellent drainage system. Pop. 123,000.

MEES, Arthur, American musical director b Columbus, Olno, 13 Feb. 1850; d New York City, 26 April 1923. He was graduated from Concordia College, Fort Wayne, Ind, and studied music in Berlin. He was assistant director, and later director, of some of the leading operas and musical associations, and published, in addition to his aunotated programs for the New York Philharmonic Society and the Chicago Orchestra, 'Chorus and Choral Music.'

MEGACLES. The most illustrious Greek of this name was the head of the family of the Alemaonida at Athens in the time of Solon. After twice expelling Pisistratus, who in 560 n.C., had made humself "Tyrant" of Athens, he was himself exiled by the latter together with all his family.

MEGALENSIA, or MEGALESIA, an annual festival at Rome (4-10 April) in connection with the foreign cult of Cybele, the Magna Mater or Great Mother of the Gods, celebrated by a procession of her eunuch-priests, by circensian and theatrical shows, and at the close a carnival.

MEGALITHIC MONUMENTS. See DOLMEN; MENILIRS; STONES, STANDING; STONE CIRCLES.

MEGALONYX. See Ground-Sloths.

MEGALOPOLIS, meg-a-lop'o-lis, or SI-NANON, Greece, a ruined city on the ancient ITelisson, in the nomarchy of Gortynia, 5 miles north of Leondari It was founded 370 BC by Epaminondas (qv.) as the federal capital of Arcadia and was a magnificent walled city, five and one-half miles in circumference; it was frequently but unsuccessfully attacked by the

Spartans. In 222 BC it was captured and partially destroyed by Cleomenes III From 1890-93 the British School at Athens excavated the site and revealed the Precinct of Zeus Soter, the Agora, the Stoa of Philip and the Stoa of Myropolis, etc.

MEGALOSAURUS, meg"a-lo-sa'rús, a genus of huge catnivorous dinosaurs of the group Theropoda Their remains occur frequently in the European oolitic rocks The extreme length was about 50 feet They were covered with scales and built like lizards, but with proportionally longer, heavier legs. See

DINOSAURIA

MEGANTIC, Canada, town and county seat of Frontenac County, Quebec, on Lake Megantic, the Chaudiere River and the Canadian Pacific Railway, 50 miles east by north of Sherbrooke It is the seat of a business college and of a convent. The leading industry is the manufacture of pulp. Pop. 5,000.

MEGAPHONE (a Greek word meaning "great sound"), an instrument magnifying the sound of the voice many times, so that one can be heard at a considerable distance. In its simplest form it is a cone-shaped trumpet, and the speaker shouts into the small end, the instrument directing the sound waves wherever it is aimed. This form is used by announcers at base ball games, etc. The form invented by Thomas A Edison consists of two large funnel-shaped receivers in which the waves of sound are collected and concentrated and carried by means of flexible tubes held to the ears of the person using the instrument. In the instrument called telephone-megaphone, the mouthpiece of the telephone is connected with four transmitters which multiply the usual telephone sound of the voice by four, and it is sent by wire, so increased, into the megaphone, which sends it forth into space with sufficient intensity to carry it with perfect distinctness throughout a large church or hall. One form of megaphone is largely used by deaf persons.

MEGAPODES, a general name for the brush-turkeys or mound-birds of Australia constituting the gallinaceous family Megapodudæ, so named in reference to the disproportionately large size of the feet; and remarkable for their breeding habits. The family, although mainly Australian, is represented in many of the South Sea Islands and in the Philippines, replacing the pheasants, which are absent from that region There are 7 genera and 20 or more species, mostly with restricted individual ranges, and varying in size from that of a turkey to that of a large pigeon, the sexes being always alike in plumage. The general colors are browns and yellows with the naked wattled parts brightly colored. They have a short, strong bill; the head and neck almost naked and wattled; the wings short and round, the tail large; the legs and feet large, strong and provided with great claws. Megapodes are terrestrial birds found in hill-valleys, among thickets or along river and sea beaches. They run well, but if hard pressed will take to trees where they hop about awkwardly, their flight is heavy, but may be long sustained. Hoarse, chuckling, cackling or mewing cries express the utterances of the different species, which are often heard at night. The food consists of

fallen fruit, seeds, berries, worms, snails, insects and even small crabs. The flesh is darkcolored and not good, though palatable to the

Australian aborigines.

One of the best known species is the brushturkey or mound-turkey (Catheturus lathami), also known as the wattled talegalla and the New Holland vulture, the latter name being given to it on account of its yellow, naked head and neck, covered in part with fleshy wattles It is rather common in New South Wales, inhabiting the most thickly wooded parts. It is a large bird, about the size of a turkey, with blackish-brown plumage. It is shy, and when pursued, endeavois to escape by running through the thickest brush, or by leaping to the lowest branches of a tree, and thus avoids the dingoes or native dogs, which, however, often hunt it down on open ground. It is easy game to the sportsman, who finds it roosting under shelter of the branches of trees during the heat of the day, and although several of a flock are shot, the rest keep their place undisturbed They are generally seen in small flocks, and make their nests together, the females heaping up, by means of their feet, mounds of several cartloads of earth and decayed leaves, which are used from year to year, new materials being added every year. The eggs are separately buried, often by several females, within the mass, where they are hatched by the heat of the fermenting mound. The parent birds parently the day. tially uncover them during the day Nearly a bushel of eggs may sometimes be found in a single heap. The male bird pays great attention to the young after they are hatched, covering them up partially in the mound at night for warmth. The flesh of the talegalla is excel-Icnt, and the eggs are also very delicate and eagerly sought after. Two other species occur in New Guinea.

South and West Australia have another familiar megapode in the mallee-hen or "native pheasant» (Lipoa occellata) - a large graybrown bird with eye-like markings on the wings and back, and the naked neck and wattles blue; its mounds are comparatively small and often made individually. A bird often confounded with this in books because of similarity of name is the maleo (Megacepalon maleo) of North Celcbes, which has the singular habit of making a general migration in the breeding season to the sea-beach, where small groups of females dig large holes in the sand just above highwater mark, and day by day bury eggs there until the quota of each is laid; these gradually hatch under the influence of the hot sand. The largest genus is Megapodnus, whose 15 species are scattered over all the island region between Samoa, the Philippines and the Micobars, each group having a distinct species. The most widely distributed and best known is M tumuhis, the common mound-bird or scrub-turkey of Northern Australia and the Papuan archi-pelago, which fashions mounds 10 or 11 feet high in the densest woods, continues to use them year after year, and lays pale, coffee-colored, thin-shelled eggs in straight burrows penetrating the mound In some islands the eggs of these birds are an important food resource. The young are well fledged when they emerge from the egg and scramble out of the mound, but are attended to by their parents for some time. Consult Newton, Dictionary of Birds' (1869); 'Proceedings,' Zoological Society of London, 1876, 1888, etc., and works on the omithology of Australia and Oceanica

MEGAPOLENSIS, Joannes, Dutch Protestant missionary to the North American Indians: b Koedyck, Holland, 1603; d. New York, 24 Jan. 1670. His family name, van Mekelenburg, he Hellenized to Megapolensis In 1642 Van Rensselaer, the first Patroon, brought him to New York from Holland, and he soon learned the Mohawk tongue and preached successfully among the Indians near Albany, several years before John Eliot's mission or any other Protestant preaching to the Indians. From 1649 until his death he was pastor of the Dutch church in New York, where he showed little tolerance to Lutherans and Independents. He advised peaceable surrender to the English in 1664. His account of the Mohawks is published in the third volume of the New York Historical Society's 'Collections' (1870).

MEGARA, Greece, the capital of ancient Megaris (qv), between Attica and Corinth, also a modern town in the eparchy of Megaris, of 9,500 population.

MEGARIAN SCHOOL OF PHILOS-OPHY, a Greek school of philosophy based on and developed from a part of the Sociatic system. Euclid of Megara was the first to give definite form to its teaching. Eubulius was also a prominent member of this school, which confined itself mainly to dialectic methods, and sought to unite the Sociatic ethical principle and the Eleatic theory of the One, to whom only true being might be attributed.

MEGARIS, meg'a-ris, Greece, the name of an ancient state or small district bounded north by Bootia, east by Attica, south by the Saronic Gulf and the territory of Corinth, west by the Corinthian territory and the Corinthian Gulf; area, about 143 square miles It is a mountainous country, the only plain being that on which the capital was situated. Mount Citharon was on the north boundary, separating it from Beotia. The people were traders and sold their textiles over a large area. The only important town was Megara, situated a mile from the sea, opposite the island of Salamis It contained a Pelasgian citadel, called Caria, on a hill northwest of the city, with a temple to Demeter called Megaron, from which the name of the town is supposed to be derived. It had flourishing colonies at an early period, and its navy was so powerful that it was only after a long struggle with it that Athens obtained possession of Salamis. It afterward became annexed to Attica, of which Megaris formed one of the four ancient divisions. It was successively conquered by the Dorians and the Corinthians, but afterward asserted its independence, and became wealthy and powerful

MEGASTHENES, a Greek historian, who about the year 300 B.C., as ambassador of King Seleucus Nicator at the court of the Indian king Sandracottos, gathered the material for a geographical and historical account of India that, reaching us in the form of fragments and worked over in Straho, Diodorus and Arrian, is our chief source of knowledge of that country in antiquity There is an edition of the fragments by E. A. Schwanbeck (Bonn 1846); also

a translation by McCrindle, 'Ancient India as Described by Megasthenes and Arrian' (Calcutta 1877).

MEGATHERIUM, a gigantic fossil groundsloth, the largest known edentate, representing the family Megatherudæ, and especially the species Megatherium americanum, whose remains are found plentifully in the Pleistocene strata of Argentina and Patagonia These early edentates were so generalized, that, as compared with modern forms, they exhibit the head and teeth of a sloth, associated with the vertebiæ, limbs and tail of the ant-eater Some of them attain a gigantic size, at least as large as an elephant, but with shorter limbs and a bigger tail, and the latest species are the most bulky. Megatherium, according to Woodward, seems to have been entirely destitute of dermal armor. The only one of its allies in which bony plates have been discovered is Mylodon, and they are very small and not fused together. The pelvis and hind limbs are heavily formed, showing that the animal was in the habit of standing on them, steadied by the powerful tail, like a kangaroo They fed on the branches of trees. The mylodons were somewhat smaller than the megatheria, with a skull and teeth more like those of the modern sloths, and the three inner digits of the forefoot bear claws, about equal in size, instead of the huge middle-finger claw of the Megatherium. In both animals the hind foot lacks digit I, but II and III bear claws, The typical species of mylodon (M. harlam) was about as large and of much the same form as a thinoceros, and inhabited the southwestern United States, while various other species lived in South America. The long-headed South American genera, Scelidotherium and Megalonyr, are other forms of the same family. See GROUND-SLOTHS. Consult the paleontological writings of Leidy, Lydekker and Woodward; also Scott, G. B., History of Land Mammals? (1913).

MEGIDDO, an important fortress city of ancient Canaan. Thothmes III captured it in the 23d year of his teigu, and took therefrom magnificent spoils. The city is mentioned several times in the Tel-el-Amarna correspondence. Though nominally in the territory of Manasseh (Jos. xvii, 12, 13; Judg i, 27, 28) it remained in possession of the Canaanites. Near the "waters of Megiddo" Barak and Deborah defeated the Canaanites under Sisera (Judges v, 1921). Solomon restored the fortifications (1 Kings ix, 15) and Ahaziah is said to have died there (2 Kings ix, 27). Finally it was at Armageddon (Har-Magedon, mountains of Megiddo) that the great conflict of Revelations xvi, 16, was to take place. The site of Megiddo may now be considered as proved to be Tel-el-Mutesellim, a great mound four miles northwest of Tel Tanaach. It was evidently of great strategic importance since it commanded the pass from the Plains of Sharon to the Plain of Esdraclou, which in all the centuries from Thothmes III to Allenby in 1917–18 has been the route of armies. Fortifications preceding 2000 n.c. have been uncovered on the site, together with the remains of several cities which rose here successively and vanished. Here too was found the seal of Shama, servant of Jeroboam (II?). In Roman times the place was a fortified post—the Legio of

Eusebius, the modern el Lejjun Consult Schumacher, 'Tell el Mutesellum Bericht über die 1903 bis 1905 veranstalteten Ausgrabungen 1 (Leipzie 1908)

MEGNA, meg'na, or MEGHNA, India, the estuarme outlet of the Gauges and Brahmaputra (qqv), in Bengal. There are four principal mouths, producing three islands. The tidal bore is characterized by its velocity, which endangers navigation, advancing at the rate of 15 miles an hour, and frequently attaining a height of nearly 20 feet. As the bottom is loose sand; it shifts continually, making navigation difficult

MEGRIM. See MIGRAINE

MEHEMET (mā'hě-met), or MOHAM-MED (mō-ham'ěd), ALI, viceroy of Egypt b Kavala, Macedonia, 1769, d Cairo, 2 Aug 1849 An orphan, he was brought up by a janizary captain, governor of Kavala, who married him to a kinswoman and made him a milita officer. When the French invaded Egypt he was sent there, tose tapidly, became the confidant of Koshrew, pasha of Egypt, and, by treachery both to the pashas and the Mamelukes and by a liberal use of his wealth, in July 1805 became pasha of Catro, whence his power quickly spread over the rest of Egypt His utterly unscrupulous policy was shown by his massacre of nearly 1,700 Mamelukes in 1811 He extended the limits of Egypt by wars on the Arabian Wahabees, by the possession of Nubia and Kordofan, and by the treacherous conquest of Syria, in which he aimed at independence of the Porte This first break with Turkey was settled by the Powers, and in 1839 the Sultan was forced to call on the Powers to help him turn Mehemet out of Syria: by the treaty then concluded he surrendered Syria, Candia and Hejaz; but was made hereditary pasha His internal administration was vigorous, both agriculture and manufactures flourished, thanks to French capital solicited by Mehemet, who also introduced European methods into his army, and established a system of education. He was insane during the latter part of his life, and was succeeded by his grandson; his son, who took his place as regent in September 1848, died in November 1848.

MEHMET, Turkish form for MOHAMMED.

MEHRING, Franz, German historian, critic and socialist philosopher: b. Schlawe, Pomerania, 27 Feb 1846; d Berlin, 29 Jan. 1919 He was of middle-class Pomeranian origin, but became interested early in life in the struggles of the poor. His life is an interesting example of the career of a political thinker who passes out of the organizations of his own class and into those of the lower classes. by natural sympathy, although in Mehring's case this process took a long time He attended the University of Berlin, where he obtained the Ph D. degree, simultaneously working for a democratic newspaper, Zukunft, under the direction of Johann Jacoby and Dr. Guido Weiss After this paper was suppressed (1871), he became a member of the staff of Die Wage, a weekly edited by Dr Weiss. In 1873 appeared Mehring's first socialistic pamphlet, "Herr von Treitschke, der Sozialistentoter, und die Enziele des Liberalismus," which, as its title indicates, is an attack

upon Treitschke (qv). When the two chief socialistic bodies in Germany united at Gotha in 1875, Mehring was sympathetic to the new party but did not become a member, and a rather personal controversy which he had with Leopold Sonnemann editor of the Frankfurter Zeitung, for which Mehring had been Berlin correspondent, removed him more and more from the activities of the Social-Democratic party From 1877 to 1882, Mehring was unfavorably disposed toward the leaders of the party, and in his 'Geschichte der deutschen Sozialdemokratie, which he began writing in those years, he made many attacks upon them, for which he was seriously taken to task at the Dresden Party Congress He defended himself in a little book 'Meine Rechtfertigung' ('My Justification'), in which he asks forgiveness for having been so foolish as to believe that the monarchic régime might develop into an honest democratic republic, which idea, he explains, has been completely corrected by the anti-socialistic laws as administered by the Prussian government. Yet Mehring still hoped that it might be possible to found a hourgeois demociatic party in Germany, in which work, which was foredoomed to failure, he was associated with Lenzmann (1884). He was editor-in-chief of the Berliner Volkszeitung (1885-89), but was forced to resign from that paper because of a controversy with Paul Lindau (qv), arising out of the latter's maltreatment of the actress Elsa von Schabelski (by a curious coincidence, Paul Lindau's death in January 1919, coincided almost to a day with that of Mehring). Mehring has written profound historical analyses, among which the best are 'Die Lessing-Legende' (1893) and 'Gustavus Adolphus' (1894) As a man of 70 his hostility to the Cormen Imperial government was still time. German Imperial government was still unbroken, and together with Rosa Luxemburg and Kail Liebknecht he wrote, in January 1915, a pamphlet attacking the militaristic system that had plunged Europe into war, known as the "Junius" pamphlet. This appeared in Switzerland and was secretly circulated in Germany (English translation 'The Crisis in the German Social-Democracy, New York 1918) He spent considerable parts of 1916 and 1917 in jail, under "preventive detention," but had to be released because of his failing health. In January 1918 he was elected a member of the Prussian Landtag, on the social ist ticket, and distinguished himself in that body by his biting comments on the inability of the Prussian military leaders; Mehring had always had a sort of amateur interest in military affairs; a number of his pamphlets deal ably with questions of this kind. Shortly before (September 1918) the final defeat of the German armies (October) on the western front, Mehring predicted that the hope of the militarists in the inability of the United States to land sufficient troops in Europe would be disappointed. His death was due to pneumonia, and coming, as it did, close upon the murder of Liebknecht and Rosa Luxemburg (15 Jan. 1919), it considerably depressed the hopes of the radical element ("The Reds") of the Gertalia of the four daily the four daily of the four daily of the four daily the four daily of the four daily the four man Social-Democracy Of the four chief leaders of the so-called "Spartacus" group, three had therefore met death in one month, and only one, Klara Zetkin (qv.), an old woman, herself seriously ill was still alive 1892

in April 1919. Consult also Die Neue Zeit (1882 et sequitur, Stuttgart); The Class Struggle (New York 1917 et sequitur)

JACOB WITIMER HARTMANN

MÉHUL, Etienne Henri, ā-tē-čn ŏn-rē
mā-ul, French musical composer. b Givet
(Ardennes), 22 June 1763, d Paris, 18 Oct 1817
For some years he substituted the name
Nicholas for Henri. He studied at Paris under
Gluck, and after the departure of the latter for
Vienna, Méhul presented to the Royal Academy
of Music the opera of 'Cora and Alonzo,' the
representation of which was delayed for six
years. He then turned to the Opéra Comique,
which gladly received his 'Euphrosine and
Coradin' in 1790. His patriotic hymns, 'Chant
du Départ,' 'Chant de Victorie,' and 'Chant
Retour,' greatly increased his fame. He was
chosen a member of the Institute in 1796, of the
Academy of Fine Arts in 1816, and a knight of
the Legion of Honor in 1802. His chief operatic
work is 'Joseph' (1807). His style as a composer is remarkable for dramatic force and
coloring. There is a 'Life' by Pougin (1889)

MEIBOMIA, a genus of crect perennial herbs of the pea family, of which about 150 species are natives of warm and temperate America, Africa and Australia. More than 40 species belong to the United States, some of the more familiar of which are called "tick-seeds"

His statue was erected in his native town in

MEIDERICH, Prussia, town of the Rhine province, 15 miles northeast of Kiefeld. It contains several large iron and steel mills, machine shops, brickyards, phosphate works and saw mills. Coal deposits are worked in the vicinity and there is a large cattle trade. Its history as an industrial centre began in 1850. It was annexed to Duisburg in 1905. Pop 40,000. Consult. Graeber, 'Tausendjährige Geschichte von Meiderich' (1893)

MEIER, Edward Daniel, American mechanical engineer: b. Saint Louis, Mo, 1841; d. 1914 In 1858 he was graduated at Washington University and subsequently studied four years at the Royal Polytechnic College at Hanover, Germany In 1863 he enlisted in the 32d Pennsylvania Volunteers; served later in the artillery and in the engineers and was a cavalry lieutenant at the close of the war. He entered locomotive works at Paterson, N. J., after the war, became superintendent of machinery of the Kansas Pacific Railroad in 1867; chief engineer of the Illinois Coke Company in 1870; and two years later constructing engineer of the Meier Iron Company. He founded the Heine Safety Boiler Company of St. Louis in 1884, of which he was president in 1914 For many years Mr. Meier was president of the American Diesel Engine Company. In 1908–14 he was president of the American Association of Boiler Manufacturers and of the Machinery and Metal Trades Association. In 1911 he was president of the American Society of Mechanical Engineers.

MEIGGS, megz, Henry, American contractor: b. Catskill, N Y., 7 July 1811; d. Lima, Peru, September 1877. He was engaged in the lumber business in New York and other places but met with financial reverses and in 1848 went to California, where he again took to the lumber

business and gained an immense fortune. Reverses, however, once more swept away his wealth, leaving him with an indebtedness of more than \$1,000,000. He fled with his family to Peru, where he soon embarked upon a senes of bridge- and railway-building enterprises, which won for him immense wealth and a world-wide fame as a railway contractor. His engineering achievements in South America comprise some of the most daring feats in the listory of the profession. The construction of the Callao, Lima and Oroya road, which crosses the Andes, was his crowning achievement.

MEIGHEN, Arthur, Canadian statesman: b Anderson, Ont., 16 June 1874. He was educated at Toronto University and became a barrister. In 1908 he was elected to the House of Commons and in 1913, was Solicitor-General in the Borden government and Secretary of State and Minister of Mines, 1917. He was premier of Canada in 1920-21, and again in 1926 from July to September.

MEIGS, Charles Delucena, American physician. b Saint George, Bermuda, 1792, d 1869. In 1809 he was graduated at the University of Georgia, and in 1817 at the medical college of the University of Pennsylvania. In the same year he established his practice in Philadelphia and became prominent as an obstetrician. He was professor of obstetries and diseases of women and children at the Jefferson Medical College from 1811 to 1861. He was one of the first editors of the North American Medical and Surgical Journal, which he helped to found in 1826. Dr. Meigs published The Philadelphia Practice of Midwitery (1838; 2d ed., 1842); "Lectures on Some of the Distinctive Characteristics of the Female' (1847); "Females and their Diseases" (1848; 2d ed., with title "Woman; Her Diseases and Remedies," 1851; 3d ed., 1851); "Remarks on Spasmodic Cholera" (1849); "Obstetrics" (1849; 3d ed., 1856); "Observations on Certain Diseases of Children" (1850); "Treatise on Acute and Chronic Diseases of the Neck of the Uterus" (1854), "On the Nature, Signs and Treatment of Childbed Fevers" (1854); translations of Huteland's "Treatise on the Scrofulous Disease" (1829); Velpeau's "Elementary Treatise on Midwifery" (1831); Colombat de L'Isère's, "Treatise on the Diseases and Special Hygiene of Females' (1845). Consult Meigs, John F., "Memoir of Charles D. Meigs" (Philadelphia 1872)

MEIGS, Montgomery, American civil engineer: b. Detroit, Mich., 27 Feb. 1847. He was educated at Harvard and in Germany, and was for several years in the employ of the Northern Pacific Railroad. In 1882–1926 he had charge of the Des Momes Rapids Canal under the government. He is the inventor of a "canvas coffer-dam." He also constructed the United States dry dock at Keokuk. In 1898 he proposed a new method of improving country roads by using oil with a sprinkler to make a water-tight surface and lay dust, which attracted wide attention and has since been generally adopted. He built and designed many steamboats and steam dredge tenders for the United States. In 1910–13 he was the government local inspecting engineer in the construction of the great lock, dry dock and power developments in the Mississippi at Keokuk, Iowa. Died 9 Dec. 1931.

MEIGS, Montgomery Cunningham, American military others b Augusta, Ga. 3 May 1816; d. Washington, D. C., 2 Jan 1892. He was graduated from West Point in 1836 and entering the engineering corps the next year was engaged in the constituction of forts Delaware. Wayne, Porter, Niagara, Ontario and Montgomery until 1852, when he took charge of the building of the great Potomac aqueduct. In 1860 he built Fort Pickens in Florida, and in 1861 was appointed quartermaster-general of the United States army and given rank as brigadiergeneral. He was promoted major-general in 1864, and in 1875 70 he was sent by the government to Europe to make an inspection of various staff-departments, the quartermaster's in particular. After his retirement in 1882 he was engaged in preparing plans for various public buildings in Washington. He was a regent of the Smithsonian Institution and of many scientific societies, and was at his death aichitect of the Pension building

MEIGS, Return Jonathan, American soldier and proneer b Middletown, Conn, December 1731; d at the Cherokee agency, Ga., 28 Jan 1823. At the commencement of the Revolutionary War he raised a company of men and marched to the American camp at Cambridge, subsequently accompanied Arnold on his expedition against Quebec, where he was taken prisoner, and after his release was commissioned a colonel in the Continental army. He signalized himself by a brilliant expedition against a British post at Sag Harbor on Long Island, for which he received the thanks of Congress and a sword, and took a distinguished part in the capture of Stony Point under General Wayne, and elsewhere in the course of the war. In 1788 he emigrated to Ohio, and established himself at Marietta. In 1801 he was appointed by President Jefferson Indian agent of the Cherokees, among whom he passed the remainder of his life

MEIGS, Return Jonathan, American soldier and politician, son of the preceding: b Middletown, Conn., November 1765; d. 29 March 1824. He was graduated from Yale in 1788, went to Marietta, Ohio, with his father in 1788 and rose to prominence there as a lawyer. He was chief justice of the Ohio supreme count 1803-04; served in the army as a brevet colonel 1804-06; was a judge in Louisiana 1805-06; and in Michigan for the two years following. After being senator from Ohio 1808-10 he was governor of that State for the next four years, in which period he was an active supporter of the war measures of 1812-14. He was postmaster-general of the United States 1814-23.

MEIGS, William Montgomery, American lawyer and biographer: b. Philadelphia, 12 Aug. 1852. He was graduated from the University of Pennsylvania in 1872, studied law and was admitted to the bar in 1879. In addition to his law practice he devoted much time to literary work and was author of 'Life of Joseph Meigs' (1887); 'Life of Charles Jared Ingersoll' (1897); 'The Life of John C. Calhoun' (1917); 'The Relation of the Judiciary to the Constitution' (1919). He died 30 Dec. 1929.

MEIJI, may-ee-jee, the name of the most famous era in the history of Japan (1868-1912). From the introduction of almanacs and chronol-

ogy from China, 645 AD, it has been customary to select a nengo, or year-period, from certain words, mostly of happy augury, contained in the Chinese cycle of 60 years (a "cycle of Cathay"). The two words united in Meiji mean Enlightened Government Of old, it was customary to change the nengo for arbitrary reasons, but from 1808 the rule was fixed to have each year-period begin and end with the emperor's reign Succeeding the Meiji era, in 1912, was that of Tai-sho, or Great Righteousness. All the dates in Japanese historical records, before 1868, are given in year-periods and the months and days according to the lunar calendar. In 1880, Mr William Bransen, in Tokio, after elaborate investigation, published his great work, which enables one to express all the Japanese dates, of the 243 year-periods, from 645 AD, in terms of the Gregorian or European calendar, which in 1875 was adopted in Japan. Consult Clement, 'Handbook of Modern Japan' (1913), and Bransen, 'Japanese Chronological Tables' (Tokio 1880).

MEIKLEJOHN, Alexander, American educator b. Rochdale, England, 3 Feb 1872. He came to America in 1880 and was graduated from Brown University in 1893. He took his A.M. at the same institution in 1895 and his Ph D. at Cornell University in 1897. From 1897 to 1912 he was connected with Brown University, as instructor in philosophy, assistant professor, associate professor, and professor of logic and metaphysics, and was also dean of the faculty from 1901-12 In the latter year, he became president of Amherst College, retaining the position until 1924, when he resigned In January 1926 he became professor of philosophy at the University of Wisconsin There he was granted permission to put into effect an educational experiment seen to be far-reaching. The experiment was begun in September 1927. The plan involved the setting up within the university of an experimental college, devoting itself, at least in the beginning, to work in the freshman and sophomore years. The stuin the freshman and sophomore years. The student attendance was limited. All students had rooms in the same building, in which were also the offices and studies of the teachers. The latter were members of the regular university faculty. The course of study was radically different form the regular curriculum. There were ferent from the regular curriculum. There were no «subjects,» and hence, no electives; all members of the class studied the same subject matter and all teachers taught the same subject matter. There were no lectures and no classrooms. Instead, there was a combination of individual instruction with group discussion Dr. Meiklejohn hoped the experiment might lead to a combination of the advantages of the small college, and the large university.

and the large university.

MEILHAC, Henri, ŏn-rē mā-yak, French playwright: b Paris, 25 Feb 1831; d. there, 6 July 1897. Much of his work was done with Halévy (qv). He furnished the book for Offenbach's 'Grande Duchesse,' 'La Périchole,' and 'Les Brigands,' and other works of that composer Among his independent plays are 'Petite Marquise' and 'Décoré.' In 1888 he was elected to the Académie Française.

MEILLEUR, Jean Baptiste, Canadian author and educator b. Saint Laurent, near Montreal, 1795; d 1878. In 1842 he became superintendent of public instruction and retained his post until 1857. Several educational in-

stitutions were founded during his administration which was emmently successful. Meilleur became postmaster of Montreal in 1862. He was a founder of the Collège de l'Assomption. His published works included textbooks on chemistry, education and grammar, all in Fiench.

MEININGEN, mī'nĭng-čn, Germany, the chief town of the republic of Thuringia, in a narrow, well-wooded valley, on the Weira, 40 miles southeast of Erluit It is an attractive modein town with regular and handsome streets, having been practically rebuilt since the disastrous fire in 1874 which destroyed the old town. The principal buildings are the new town-house and the ducal palace with a church, private and public library of 55,000 volumes, picture gallery, museum, etc., attached The stock company of the local theatre which for 16 years enjoyed a European reputation for the excellence of its acting and staging, was dissolved in 1800 The industries are only of domestic importance and include brewing, woolen and cotton-weaving. Pop 18,000.

MEISSEN, mī'sĕn, Germany, a town of Saxony, founded by Henry I in 922-33, 14 miles northwest of Diesden, on the left bank of the Elbe, at the confluence of the Mersse and Triebisch. It has a noble old castle originally built in the 10th century and rebuilt in the 15th century on a precipitous tock above the town, recently restored. There is a fine old Gothic cathedral, 500 to 600 years old. Also the Franciscan church, a large and magnificent edifice, used as the custom-house; the church of Our Lady, or city church; the ancient church of Saint Nicholas; and other public buildings. The royal pot celain factory, first established by Bættcher (q.v), and now at some distance from the town, is the great industrial establishment of the place; there are also manufactures of matches, stoves, iron foundities and machine-works, a jute-mill, breweries, etc. Meissen is the see of an archbishop. Pop. 45,485.

MEISSONIER, Jean Louis Ernest, zhon loo-ë er-na ma-so-nya, French pamter: b. Lyons, France, 21 Feb 1815; d Paris, 31 Jan 1891 He came to Paris in early youth and entered the studio of Cogniet, meanwhile forming his style on the Dutch masters as represented in the Louvre. He first attracted attention by his illustrations of the Bible, Bossuet's "Universal History," Orlando Furioso, 'Paul and Virginia,' etc. His earliest paintings in genre to be exhibited in the Salon were 'The Little Messenger' and 'The Chess Player' (1836). His reputation grew rapidly on the successive appearance of 'The Monk' (1838); 'The English Doctor' (1839); 'The Chess Party' (1841). The times of Louis XIV and Louis XV with all the accessory richness and variety of costumes, weapons and domestic luxury, began to find in him their most successful delineator. In the many canvases which he produced in this narrow department of genre he showed a keen and strong, but not too florid, power of characterization, which was accompanied with a marvelous technique in the handling of stuffs, metals, etc. But modern history eventually claimed his attention and he found a congenial field for the exercise of his special gifts in the campaigns of Napoleon. His

pictures were often small, but finished with minute and delicate virtuosity, a good example of which may be seen in his 'Currassiers of 1805'; but he is perhaps less successful in large canvases and elaborate figure compositions than in his small paritings Among his most famous pictures of the Napoleonic cycle are Napoleon I with his Staff and (Napoleon III at Solfermo' (1864); 'Napoleon I at Friedland' (1875), now in the Metropolitan Museum of New York. In his latter days he painted Vene-New York it in sacret days it painted vene-tian scenery and architectural views with his usual dash, thoroughness and originality. In his works he shows the best qualities of the Dutch school with all its life-like expression. truthfulness and spuit combined with the delicacy of French sentiment and abandon water colors, etchings and lithographs bear admirable witness to his versatility and vigorous industry. His pictures have always fetched a high price, (finedland or 1807) having been sold for \$60,000, a sum scarcely disproportionate to that given for smaller canvases. He is to be looked upon as the founder of the new school of military painters represented by his son Jean Charles Merssomer and Edouard Detaille, his most illustrious pupil. Consult Claietie, 'Meissonier' (1881); Larroumet, 'Meissomer) (1893)

MEISTERMANN, Barnabas Francis Joseph, German archaeologist and missionary: b Platfenheim, Alsace, 27 March 1850. He received his education in the seminary of Strassburg and in 1873 was ordained to the priest-hood of the Roman Catholic Church. In 1875 he joined the Franciscan Order, was sent to France and England for a time, and from 1887 to 1893 labored as a missionary among the Chinese. Since 1893 he has resided in Jerusalem, engaged in teaching, writing and research work. His works include (La Portioncule) (1884); (Le Mont Thabor) (1900); (La Montagne de la Galifée où le Seigneur apparut aux Apôties) (1901); (Deux questions d'archéologie palestinienne) (1902); (Le prétone de Pilate et la forteresse Antonia) (1902); (Questions de topographie palestinienne) (1903); (La patrie de Saint Jean-Baptiste) (1904); (New Guide to the Holy Land) (London 1907); (Ginde du Nil au Jourdain par le Smai et Pétra) (1909). He contributed to the 'Catholic Encyclopedia.)

MEISTERSINGERS, mīs'ter-sing-erz, or MASTER-SINGERS (Ger., Meistersinger), a society of German singers formed in the 14th century. During the long evenings of winter the worthy burghers of the German cities assembled to read the poems of the minstrels. Some of the hearers were naturally led to try their own skill in verse; others followed, and the spirit of the age soon embodied these votaries of the muse into societies after the fashion of corporations. Charles IV gave them a charter and a coat of arms. They met on certain days and criticized each other's productions, in which external correctness seems to have appeared to them the chief object; few, indeed, had an idea of the difference between poetical and prosaical ideas or expressions. Their attempts in the lyric style were chiefly limited to spiritual songs; in the epic to rhymed versions of the scriptural narratives. They were also

fond of the didactic style. The rules by which the members of the societies were to be guided as to the meter, etc, of their compositions were written on a table, and called tabulatur, for the sake of enforcing a strict observance of purity in language and prosody. The chief faults to in language and prosody. The chief faults to be avoided were collected, they were 32 in number, and distinguished by particular names. He who invented a new meter, invented also a new time, the names of which were the drollest and sometimes the most senseless imaginable. Beside their stated meetings they held public meetings, generally on Sundays and festivals in the afternoon in churches In Nuremberg, where the mastersingers flourished particularly, such meetings were opened with free singing, in which anybody might sing, though not belongmg to the corporation. In this the choice of the subjects was left comparatively uncontrolled, then followed the cluef singing, when only those who belonged to the corporation were allowed to sing, and only on scriptural subjects. The judges were called Merker, and sat behind a curtain There were four: one watched whether the song was according to the text of the Bible, which lay open before him; the second whether the prosody was correct, the third cuticized the rhymes; the fourth, the times Every fault was marked, and he who had fewest received the prize, a chain with medals. Whoever had won a chain was allowed to take apprentices, to have many of whom was a great honor. Money was never whom was a great honor Money was never taken from apprentices. After the expiration of his poetical apprenticeship the young poet was admitted to the corporation, and declared a master after having sung for some time with acceptation. These strange societies originated toward the end of the 14th century at Mainz, Strassburg, Augsburg and continued in several free cities of the empire until the 17th, in Nuremberg to the 18th century, where probably the renown of Hans Sachs (qv), the famous shoemaker and poet, kept them longer in exist-

MEITNER, Lise, Austrian physicist: b. Vienna, Nov. 7, 1878. As assistant to Otto Hahn in Berlin and professor at the Kaiser Wilhelm Institute there, she became one of the world's foremost women nuclear physicists. With the rise of the Hitler regime, she was forced to flee, going to Bohr's Institute in Copenhagen. She came to the United States in 1946 to join the faculty of the Catholic University, Washington, D. C. Her researches have included study of continuous beta-ray spectra, positron emission from heavy nuclei and neutron disintegrations. After her experiments with Otto Hahn on the uranium reaction, she, with Otto Robert Frisch, showed that the process occurring was a splitting of the uranium nucleus. This phenomenon, now called fission, was utilized in the development of the atomic bomb.

MEKONG, mā-kŏng', a large river of southeastern Asia, which rises in Tibet, passes through Yunnan (a province of China), Laos, Cambodia, and French Cochin-China, and falls into the Chinese Sea by several mouths, after a course of about 2,600 miles. Its navigation is much interrupted by sandbanks and rapids The Tonle Sap, a lake covering an area of 100 square miles in the dry season and 770 square miles in the rainy season, in the southwestern part of Cambodia, receives the flood waters of the Mekong.

MELA, mē'la, Pomponius, Spanish geographer of 1st century AD and author of De Situ Orbis containing concise view of the then-known world.

MELAMPUS, in Greek mythology, son of Amythaon, who was the first mortal endowed with the gift of prophecy, and who first practiced the medical ait. He is said to have introduced the worship of Bacchus into Greece. According to the legend, he could converse with animals, and was favored by Apollo, who taught him divination. His powers saved his life when he was imprisoned in Thessaly. The worms in the wall informed him that the structure would soon fall, and he told his jailers, who withdrew, taking him with them. They informed the king and Melampus was at once in demand, courted and feted. He married one of the king's daughters and was given large estates. In ancient Megalis he was worshipped and a temple erected in his honor.

MELANCHOLIA. See Insanity.

MELANCHTHON, Hellenized name of PHILIPP SCHWARZERD (Eng "black earth"), German reformer b Bietten, in the Palatinate, Feb. 16, 1497; d Wittenberg, April 19, 1560 He was left an orphan in his 10th year and taken into the house of his grandmother, a sister of Reuchlin (see Reuchlin, Johann), the great German humanist, by whom he was affectionately treated and encouraged in his studies. In his 12th year he entered the University of Heidelberg and two years later was graduated bachelor. While he years later was graduated bachelor. While he was occupied as tutor to the son of Count von Lowenstein, he continued to give attention to his own progress in Greek, in 1514 was made master of arts at Tuhingen and thenceforth devoted himself to humanism, lecturing on Cicero, Terence, and Greek grammar. He also gave much time to the study of theology, jurisprudence and medicine. Here he first became acquainted with Erasmus' edition of the New Testament, and was through the influence of Reuchlin elected professor of Greek in the newly founded University of Wittenberg He delivered an inaugural address (Aug 29, 1518), De Corrigendis Adolescentrae Studus, which produced a revolution in German educational methods and above all met with the approbation of Luther, professor of philosophy at Wittenberg From this time Melanchthon became Preceptor Germaniae (The Schoolmaster of Germany), and the Ally of Luther. These two champions of the Reformation were brought still closer together by their union at the Leipzig Disputation (1519), in which they were confronted by Dr. Eck (see Eck, Johann von), the great opponent of Luther and the movement he was inspiring. In his handling of this adversary, both orally and by his writings, Melanchthon showed himself to be the leader of Protestant controversialists and the most learned, judicious and ready of Protestant disputants

In 1520 he married Katharina Krapp, daughter of the burgomaster of Wittenberg, and Master Philip, as he was familiarly called, as he settled down to domestic life, was placed on the theological faculty of the university, and the first fruit of his increased application to the theological study and teaching was his Loci Communes Rerum Theologicarum, which was

the first declaration of the Protestant position delivered in formal terms of dogmatic theology. The volume ran through 60 editions in his lifetime, and established its author's position as Luther's complement — in some respects the lesser spirit of the Reformation movement, but the scientific talent which supported on the intellectual side the genius and the faith of Luther. Melanchthon, by his historic learning, by his power over the classic languages, was enabled to communicate to the learned world the real principles of the new movement and the facts of the past on which it was founded. He brought to bear his deep knowledge of theological philosophy, his acquaintance with the precise terms in Greek and Latin of scriptural, patristic and scholastic statement on the main question of the dispute, and he had the calminess of the well-balanced humanist which enabled him to direct with cool and even mind the movements of his party and to keep it as free as possible from the fury and blindness of intolerance. His knowledge of Greek made him invaluable to Luther in translating the Bible His pen had an immense influence in securing the alter success of the initiative taken by bolder but less cautious and reasonable spirits, and left a mark on the German Reformation deeper, more permanent and characteristic that of any among his most enthusiastic contemporaries. His Epitome Doctimae Christianae from the first an influence which establishes its claim to be called the pandect and code of

European Protestantism

The spirit of Melanchthon was distinctly con-hatory. The Reformation had resulted not ciliatory only in a German revolt from the papacy, but in the creation of a host of jarring Protestant sects. Melanchthon's broad and far-seeing spirit was averse to division of any kind. The Augsburg Confession (qv), which was presented to the diet in 1530, surprised even the Roman Catholics by its moderate tone. It was drawn up by Melanchthon in accordance with memoranda supplied by Luther and it has all the breadth, calmness, and judicial cautiousness of Luther's friend and good genius. But this spirit of compromise, hopefulness, and patience was out of harmony with the passion for controversy which made Wittenberg a center of storm and strife. Melanchthon, however, stuck to his post at Wittenberg long after the great power and influence he once wielded had passed from him into the hands of more positive, violent, and aggressive leaders There occurred a breach between the Philippists, the followers of Melanchthon, and the Lutherans, who adhered to the extreme views of his friend on the subject of free will and irresistible grace, on the doctrine of the Lord's Supper, and on the adiaphora (indifferent matters), as the former was inclined to term the ceremonies of the Roman Catholic Church. He and his followers were assailed as "rogues" and "worshippers of Baal.". Luther stated his own views on the sacrament with such violence that the recollection of his Short Confession Respecting the Lord's Supper filled him with remorse on his death bed, where he acknowledged to his friend "Dear Philip, I confess to have gone too far in the affair of the Sacrament." The death of Luther left Melanchthon to the mercy of such zealous and fiery sectaries as had been engendered in that teeming period of intellectual and theological movement,

which the monk of Wittenberg had inaugurated. He survived Luther by several years, waiting for death, he said "as a refuge from the frenzy of theologiaus," and praying that the Protestant world might find its way at last to reunion, a

prayer which as yet remains unfulfilled

Melanchthon's important part in the Reformation movement has often been lost sight of in the blaze of Luther's more striking and popular personality. Yet he may with some reason be called the brains of the Reformation More than that, he was a man who, while he stood for progress, was averse to revolutionary change. He was a constructive rather than a destructive religious reformer, he could affect his generation only by presenting an example of intellectual refinement, moderation, tolerance, and conservation, which the warring giants of the Reformation refused to follow. In 1865 a statue was raised to him at Wittenberg and in 1883 a group comprising Melanchthon and Luther at Leipzig. He was the author of many books, including theological and controversial treatises, commentaries on the classical authors, and works on lustory and philosophy His works are found complete in the 28-volume Corpus Ref-ormatorum (1834-1800) Consult hographies by George Wilson (London 1897), J. W. Richard (New York 1898), Karl Hartfelder (Berlin 1899), Georg Ellinger (Berlin 1902).

MELANESIA, měl-a-né'shi-a (Gr. melas, black, nesos, island), collective name for the great southwesterly division of the Pacific Islands (see OLIANIA) The insular groups comprising Melanesia he, from north to south, between the equator and the Tropic of Capricoin, and from west to east they are bounded, respectively, by New Guinea and the Fiji Islands. The division is named for the extreme blackness of the people rather than of the islands themselves, for the Melanesian (q v.) is dark-skinned and Negroid. Some of his ancestors migrated from Indonesia to New Guinea, where they intermingled with the Papuans, and thence moved eastward and southward through the Solomons and New Hebrides as far as New Caledonia, to the east, their migration ceased in the Fijis, Politically, the islands of New Caledonia belong to France and the New Hebrides constitute a Franco-British condomnium. Fiji is a British colony, and the British Solomon Islands Protectorate comprises all save the northernmost of the Solomons. Bouganiville and Buka, most northerly of the Solomon Islands, and the Bismarck Archipelago (comprising New Britain, New Ireland, Lavongai, and Admiralty Islands) are part, politically, of the Territory of New Guinea, the designation for former German colonies in Melanesia captured by the Australians in World War I and subsequently administered by the Commonwealth, at first as a League of Nations mandate and later as a United Nations trusteeship. The political components of Melanesia are discussed in articles under their names.

Although Melanesia still awaits a systematic geological survey, it is known to be highly mineralized. Gold has for long been mined in Fiji and the Solomon Islands, and nickel, chrome, and other minerals are worked in New Caledonia. Sugarcane is the most important agricultural product throughout Melanesia, and in many parts of the division rice, coffee, cacao, and rubber are of great economic value. North and

northeast of Melanesia he, respectively, Micronesia and Polynesia (qqv), the other main divisions of the Pacific Islands Consult Blackwood, B., Both Sudes of Buka Passage (London 1935); Wood, G. L., The Pacific Basin A Human and Economic Geography (Oxford 1942), McGuire, Paul, Westward the Course. The New World of Oceania (London 1943); Robson, R. W., ed., The Pacific Islands Handbook (New York 1945).

MELANESIAN, a term denoting the dominant ethnic stock in Melanesia (qv) It was formed by the intermingling of an aboriginal black, wooly-haired population of Papuan origin with an immigrant Indonesian stock which had been previously modified by proto-Malayan blood and culture. However, the Melanesians vary considerably in type and language. In some parts of the New Hebrides and the southern Solomon Islands there are numerous small, primitive, and physically debased tribes very close to the lowest level of savagery who practice polygamy, infanticide, and cannibalism; but in the western Solomons the people are fine, upstanding specimens with intensely black skins. Tongan (Polynesian) blood has mixed with Melanesian in the eastern group of the Fijian Islands to produce a handsome, intelligent, wellbuilt race with a light copper-colored skin; while the Fijians are characterized by tall, fuzzy hair, in the northern Solomons the hair of many tribes is straight or only slightly wavy Excepting in the Fijis, where one language is spoken throughout the islands, the differences of speech between island and island, and even between village and village on the same small island, amount to complete incomprehensibility. Thus there has come into widespread use a primitive form of "pidgin" English with most limited vocabulary which is employed as a lingua franca not only by the Melanesians but also by French and German missionaries and traders among them. Missionary effort in Melanesia has followed the flag for the most part, although in the interior of some of the larger islands, and particularly in the northern New Hebrides, there are large numbers of savage peoples which have not yet come under civilizing influences Those who have been long engaged in evangelizing among the Melanesians include the Church of England, Presbyterian, Methodist, London Missionary Society (Congregational), Roman Catholic, Evangelical, and Seventh Day Adventist missionaries. Consult Fox, C. E., The Threshold of the Pacific (London 1924); Mytinger, Caroline, Headhinting in the Solomon Islands (New York 1943); MacQuarrie, H., Vouza and the Solomon Islands (London 1945).

MELANISM, an excess of pigment in the skm and its appendages, producing real or comparative blackness; the opposite of albinism (qv.). Melanism is less frequent than albinism, but more inclined to affect large numbers of individuals of a species, forming melanistic varieties and is seen not only in man but in other mammals; and in birds, reptiles, fishes, and in insects as, for example, certain moths which are found in Labrador and in the White Mountains of New Hampshire, showing a possible connection between melanism and cold or high altitudes. Moisture is also considered to be a determining factor, as is indicated by the fact

that the darkest races of men inhabit the warm est and dampest regions of the earth. A conspicuous example of melanism is afforded by the American black squirrels, which are melanistic varieties of various species, especially the fox squirrel (Sciurus niger) and the gray squirrel (S. carolinensis) These varieties prevail in certain parts of the United States, as the region of the Great Lakes and upper Mississippi Valley, and rarely occur elsewhere Thus a black squirrel is almost unknown in New England or the Hudson Valley. Another familiar example is found in the black leopards, which in a direct light seem absolutely black, but under reflected light betray a pattern of spots similar to those of the ordinary leopard Such examples, as is the case with other melanistic animals, often occur in the same litter of young with normal forms In many of the lower animals, as butterflies, melanistic tendencies are developed under certain conditions, especially of excessive moisture. The pigments in the skin are mainly of the class called melanins, which produce dark hues. Total abnormal melanism in man is unknown, but cases of partial melanism are on record. In one instance one half of the face was white, the other. black A case is on record of a 16-year-old; girl, a laundress, whose neck, face, and upper chest became blue on certain occasions. was otherwise apparently normal, but the skin was so pigmented that when she blushed her color was blue instead of red, the change appearing with chameleonic rapidity and being associated with the accession of blood to the skin A white towel was stained blue by being rubbed over her skin. Other cases of skin discoloration are that of a man who became black in places and yellowish brown in others, and that of an unmarried woman white until she was 21 and thereafter black as a Negro cause of this condition is unknown. Melanoderma, chloasma, and liver spots are terms applied to irregularly shaped yellow, brown, and black colorations of the skin. Some of these spots are due to scratching following the bites of body vermin, to prolonged pressure upon a portion of the skin, prolonged use internally of preparations of silver, to racial admixture, or to general diseases, such as cancer or tuberculosis. See Coloring Matters; Coloration, Protective.

MELANITE, a very black variety of garnet, especially the lime-iron variety, in which lime largely preponderates in the protoxides. Melanite occupies a place midway between schorlomite and the garnets pure and simple; this is notably true of the sort containing the rare element ittanite (q.v.). The group includes all the darkish garnets, with the exception of the precious garnet, technically the pyrolite, which varies from red to black. With the green demantoids the blackish melanites make up the greater part of Dana's second class of garnets, the iron garnets.

MELANORRHOEA, měl-à-nŏ-rē'à. See Varnish Tree.

MELASMA, a disease marred by discoloration of the skin. The term is rightly used in connection with a pigmentation of the skin, sometimes diffuse (color varying—dusky yellow, greenish brown, or even

black), and believed to be dependent upon degeneration of the suprarenal capsules or the semilunar ganglia (See Addison's Disease). Sometimes the term is applied to the conditions known as liver-spots and "moth-patches"

MELASTOMACEÆ. See Deer Grass.

MELBA, Nellie, Australian prima donna: b Melbourne, about 1860 She studied there in the Presbyterian Ladies' College, then took up music under Matchesi in Paris On 15 Oct. 1887 she made her début in Brussels in 'Rigoletto', at that time gave up her family name Mitchell and took the stage name Melba, which is said to have been suggested by the name of her native city; in 1889 she appeared in Paris at the opera, where she stayed for three years, during which she appeared in London in Italian répertoire; and after 1892 toured Europe and America. Her best rôles were Ophelia, Juliette, Lucia and Nedda in 'I Pagliacci' She was created Dame of the British Empire in 1918. She published her 'Melodies and Memories' (1925). She died 23 I'cb. 1931.

MELBOURNE, měl'bern, William Lamb, Viscount, English statesman: b 15 Maich 1779; d 24 Nov. 1848. Caicfully trained by his mother, he entered Eton in 1790, Trinity College, Cambridge, in 1796, and Lincoln's Inn in 1797; studied law in Glasgow; was called to the bar in 1804; and in 1805 was elected to the House of Commons, where he followed Fox, leader of the opposition. He lost his seat in 1812 because of his vote for Catholic emancipa-tion; was returned in 1816; served as chief secretary in Ireland in 1827; and in 1828 entered the House of Lords upon his father's death Only then did he begin to figure in politics, and that only because of his popularity, for he had no official ability, being neither diligent nor brilliant. As home secretary under Grey in 1830 he was a failure; but in July 1834 the king induced him to form a ministry, and again in 1835, in spite of the king's effort to foist Peel on the country in November 1834, he became Premier He remained in office until August 1841, thus covering the early years of the reign of Victoria, whom Melbourne ally instructed in the duties of her position. His tuition of the young queen seems, however, the only event of his long administration, and he must be classed rather as a politician than as a great statesman, since he was scarcely more than indifferent to the reform measures of the day He was a man of much learning, of a rather attractive, though coarse and habitually profane, wit and of a strange admixture of constitutional conservatism and political liberalism His wife, Lady Caroline Ponsonby, whom he married in 1805, was separated from him in 1825; she wrote several novels and was a friend of Lord Byron. See Norton, CAROLINE ELIZABETH; and consult Torrens, W. M., 'Memoirs.'

MELBOURNE, Australia, the capital of the state of Victoria, the second largest city of Anstralasia, situated around Hobson's Bay, at the northern extremity of Port Phillip, 40 miles north of its entrance from the ocean between Points Lonsdale and Nepcan. The city and its numerous suburbs occupy an extensive undulating area, with the Yarra River, a stream of no great size, winding through it. The central and most important business part of the city is on the north bank of the Yarra two miles by a

direct railway line from the river's outlet in Hobson's Bay, but nine miles by the meandering water route. The city is built on a rectangular plan with fine wide streets lined with handsome and substantial public buildings and residences. Numerous lines of railway connect with the interior and the extensive suburban districts, which include such important places as Collingwood, North Melbourne, Pitzroy, Carlton, Brunswick, South Melbourne, Richmond, Piahran, Saint Kilda, Port Melbourne, etc. The city is well lighted, and paved, and is abundantly supplied with water, while millions of dollars have been expended on a new and perfect system of drainage and sewerage.

The public buildings of Melbourne are noteworthy The Houses of Parliament contain the State Legislative Assembly and Council, Government House is a palatial building, conspicueniment House is a palatral building, conspicuous from every part of the city, with a tower 145 feet high. Other public buildings include the law courts, forming an extensive square, the post-office, the custom-house, the treasury, the land and mining offices, the mint, the free library with some 300,000 volumes; the university, with an admirable museum belonging to it and a splendid hall (the Wilson Hall) in the Gothic style, the Ormond Presbyterian College, the town hall, with a Presbyterian College, the town hall, with a large assembly room containing a splendid organ, the exchange, observatory, meteorological station, and atheneum. The ecclesiastical buildings include an Anglican Cathedial, a Roman Catholic Cathedral and the Scots chuich, with a fine steeple. There are several "sky-scraper" office and store buildings; many banks and business premises are attractive; and the Exhibition building deserves notice. At the head of the educational institutions is Melbourne University (with over 250 professors, lecturers, and teachers), with which are attiliated the four denominational colleges, Trinity (Episcopal), Ormond (Presbyterian), Queen's (Methodist) and Newman (Roman Catholic) Charitable and benevolent institutions are numerous. There are several parks and other grounds for public recreation, and among these the Botanic Garden deserves special notice on account of its extent (100 acres), its beauty, and the value of its collection of trees and plants. The beautiful Fitzroy Gardens also deserve special mention. Melbourne is the see of a Roman Catholic archi-episcopate and of an Anglican bishopric. The United States is represented by a consul-general. The chief industrial products of Melbourne are leather, furniture, clothing, flour, ales, cigars, ironware, woolens, etc. The shipping trade is large both in exports and imports, the chief of the former being wool and gold, of the latter manufactured goods. Most imports are subject to a heavy duty. Vessels of 26 feet ject to a heavy duty. Vessels of 26 feet draught can ascend the Yarra. Its navigation has been much improved, and the Coole canal shortens the passage. The largest vessels are accommodated at Port Melbourne and Williamstown, with depths of about 36 feet both on Halvoor's Part Day 1977 December 1987 on Hobson's Bay; l'ort l'hillip Bay affords unlimited anchorage for the largest vessels. The tonnage of vessels entered 1930-37 was 8,173,042.

population of the state.

The first settlements on the site of Melbourne were made in 1835, and a year or two

Pop. of Melbourne, including the suburban mu-

nicipalities, 1,000,000, more than half the

atter it received its present name, being so called after Lord Melbourne, who was then British prime minister. It was incorporated in 1842 and became a bishop's See in 1849. In 1851 it became capital of Victoria (then established as a separate colony), and received an immense impetus from the discovery of gold fields.

A centennial exhibition was held in 1888 in celebration of the founding (in 1788) of the Australian colonies. A great conflict between labor and capital took place in 1890, and a strike by the labor-unionists took place on a very extensive scale both in Victoria and New South Wales. In 1892-93 Melbourne suffered severely from commercial depression, financial crises and banking disasters. The first Parliament of the Commonwealth of Australia was opened in the Exhibition Building on 9 May 1901 by the Duke of Cornwall and York (afterward George V). Consult 'Victoria and its Metropolis, Past and Present' (1889); Gordon and Gotch, 'Australian Handbook' (1928)

MELCHERS, Paulus, German cardinal b Munster, Westphalia, 6 Jan. 1813; d Rome, 14 Dec. 1895 He studied law at Bonn and theology at Munich and Munister, was ordained priest in 1841; in 1857 became bishop of Osnabruck, and in 1865 Pope Pius IX nominated him archbishop of Cologne At first opposing the doctime of papal intallibility at the Vatican Council, Melchers afterward accepted 11, in agreement with the majority, and dealt severely with professors who sought to prevent its declaration In the Kulturkampf (q.v) his conspicuous activity brought him into collision with the representatives of government, and in 1876 he was removed from his archbishopric. His writings include Pine Unterweisung fur Die das heilige Altarsakrament) (1878); katholische Lehre des Herrn' (1883), and 'Das Leben der alleiseligsten Jungfrau und Gottesmutter' (1884).

MELCHITES, mel'kits, those Christians of western Asia and of the Levant who acknowledge the supremacy of the Roman Pontiff and accept the dogmas of the Roman Catholic Church. The Syriac and Egyptian congregations of this name in the main belong to the Greek Church though in some unimportant matters of ceremony and discipline they take an independent course. They are, however, under a chief bishop of their own, who is styled patriarch of Antioch. The term Melchites is a nickname. It means "Royalists" and was given to them by the oithodox Greeks with the implication that they accepted the decrees of the Council of Chalcedon merely at the dictation or in conformity with the example of the emperor. Celibacy is imposed upon their bishops, but their priests are at liberty to marry. Their littingy is in the Arabic language; they use unleavened bread in the Eucharist and in their monastic houses they follow the Basilian rule. There are said to be 100,000 of them. Consult Neale, 'History of the Eastern Church >

MELCHIZEDEK, mčl-kiz'ě-děk ("king of righteousness," that is, righteous king), in the story of Genesis, king of Salem and priest of "Supreme God" He met Abram on his return from the victorious expedition against Chedorlaomer, gave him his blessing and re-

ceived tithes from him. The antelegal kingpuest stands in Psalm ex as a figure typical of the Messiah the vicegerent of Jehovah, and in Hebrews vii, 3, of the kingly priesthood of Jesus There are various views as to the identity of Melchizedek, as he is named in many ancient writings Rabbi Kaulmann Kohler of the Hebrew Union College, Cincinnati, states in the 'Jewish Encyclopedia' that the personality of Melchizedek rests upon ancient Jewish tradition, and identifies him with Malki-Zedek, first king of Zedek, the ancient name of Jerusalem Philo speaks of him as the "Logos", others believe he was Shem, ancestor of Abraham The chapter in Genesis containing his story is a unique passage of the Pentateuch, and according to Wellhausen is one of its latest additions Ewald counts it the earliest portion of the history and based on old Canaanitish records; others, as Noldeke, explain it as utterly unhistorical

MELCHTHAL, mělh'tal, Arnold von (Arnold an der Halden), Swiss patriot He is considered by some authorities to be a mythical character, but was supposed to have lived in the 14th century He incurred the wrath of the governor and was compelled to flee to escape punishment, whereupon the governor seized Arnold's aged father and had his eyes put out. The son, enraged at this barbarity, with two friends planned a revolt against the Austrian power which they successfully conducted Consult Ægidius Tschudi, 'Chronicon Helveticum' (1505–72)

MELDOMETER. See MELTING POINT

MELEAGER, according to Greek legend, the hero of the Calydonian boar hunt. The earliest form of the story is found in the 'Iliad,' according to which Meleager is son of Æneus, a king of Ætolia, and Althæa, daughter of Thestius When the boar had devastated the land Meleager gathered a band about him and after a great struggle and with considerable loss of life slew the monster A quarrel over the spoils arose between the Etolians and the Curetes, the latter being under the leadership of Meleager's maternal uncles. In the quarrel the latter were killed by Meleager, who was now cursed by his mother, who prayed the Furies and gods of the nether world to destroy him The hero with-drew from the fight until the Curetes stormed the town when he launched forth to save his people and was slain, according to some, by the Furies, according to others by the hand of Apollo Other versions of the story were current in later times, one of which is preserved in an ode of Bacchylides The Calydonian Hunt was a favorite subject with artists from early times, and a copy of a work by Scopas, executed originally for one of the pediments of the temple of Athena Alea at Tegea, is now in the Vatican, Rome In the Fogg Art Museum of Harvard University is an excellent replica of the Vatican copy.

MELEDA, Jugoslavia, an island off the southern coast of Dalmatia in the Adriatic. It is about 25 miles long and the Austrian name was Babinopolie. It is believed by some to be identical with Melita on which Saint Paul was stranded.

MELENDEZ VALDES, Juan, hoo-an' mā'lēn'dēth val-dās', Don, Spanish poet: b. Ribera del Fresno, Badajoz, 11 March 1754, d. Montpellier, France, 24 May 1817 He studied law at Salamanca, where he attracted attention by his poems in the old ballad manner and was taken up by the poet Cadalso In 1780 he received the first prize in a competition under the control of the Spanish Academy for his pastoral 'Batilo,' and, in 1784, his comedy, 'Las Bodas de Camacho,' won a prize from the city of Madrid, although unsuccessful on the stage In Madrid he won the favor of Jovellanos, who appointed him professor of the classics in the University of Salamanca and urged him to enter upon an unfortunate political career; he became judge in 1789, a judicial chancellor at Valladolid in 1791, and fiscal in the Supreme Court in Madrid in 1797. He suffered biref exile after the fall of Jovellanos (q v) in 1798; but in 1802 returned to Salamanca His sympathy with France, however, made him more than ever unpopular, and after the expulsion of Joseph Bonaparte, he went into exile in France He was one of the most prominent figures in Spanish literary life during the 18th century

MELETIUS, (1) founder of the sect of Meletians IIe was bishop of Lycopolis in the 4th century, and antagonized Peter, patriarch of Alexandria, by refusing absolution and communion to the lapsed, that is, those who under the stress of persecution had renounced their faith A schism resulted from the dispute and Meletius traveled through Egypt and Syria gathering thousands of followers, until the Council of Nieæa, 325, deprived him of authority and he died soon after, a merely titular bishop (2) Another Greek ecclesiastic of the same name and century, who was made bishop of Antioch in 360, when the Arian controversy was at its height.

MELGAREJO, Mariano, ma-rē-a'nō mālgä-rā'hō, Bolivian soldier. b Cochabamba, Bolivia, 18 April 1818; d Lima, Peru, 23 Nov 1872 He entered the army at an early age and by his courageous though somewhat unprincipled conduct in the many revolutions in his country, rose to be chief adviser of General Acha in 1862 and was made a general In 1864 he turned against Acha who was then President, instigated a revolution and seated himself in the presidential chair Duning a brief absence of Melgarejo the ex-President Belzu returned and reinstated himself in the presidency only to be shot by Melgarejo himself, who then became dictator. He crushed a revolution in 1866 and in that year formed an alliance with Spain against Peru and Chile. Revolutions followed and he was compelled to flee the country in 1871 and was killed in a quarrel at Lima.

MELIC GRASS (mel, honey), delicate genus of grasses growing in the shade of woods, of the order Gramineæ, having a lax panicle and spikelets of 2-5 awnless florets, of which one generally is imperfect. M. uniflora is of graceful and delicate appearance; cattle are fond of it. This species is common in Europe. M nutans is common in the United States west of the Rockies M. altissima, a Siberian species, growing to the height of three or four feet, has been introduced in parts of

Europe, and yields a considerable bulk of herbage. It is perenmal.

MELICERTES, son of Athamas and Ino. In tear of Athamas, whose children by Nephele, Phrixus and Helle, she had tried to kill, Ino jumped into the sea with Melicertes. She became the sea divinity Leucothea, he Palemon, whom the Romans identified with their god of harbors, Portunus Some identify him with Moloch It is recorded that children were sacrificed to him at Tenedos.

MELICOCCA ($\mu\lambda t$, honey — κόκκος, berry), genus of trees of shrubs of the natural order Sapindaceæ, comprising about six species, one of which M bijuga, native of the West Indies, is there universally cultivated for its fruit. It is called the honeyberry and the Jamaica bullace plum; by the Spaniards, Monos; by the Dutch, Kinpnee It is 10 to 20 feet high. The fruit has an agreeable flavor and varies in color from yellow to jet black. It is now grown in California and Florida. When roasted the seeds may be eaten after the manner of chestnuts. Some other species also yield edible fruits

MELIHAII, the salting of meat according to Jewish ceremonial, that it may be without blood and ritually fit for eating, thus complying with the law (Gen. ix, 4)

MELIKOFF. See Loris-Melikoff.

MELILITE, or MELLILITE, a native silicate of sodium, calcium, magnesium, aluminum and from Potassium is also commonly present to some extent. Melilite crystallizes in the tetragonal system and has a vitreous or resinous lustre and usually a honey-yellow color, from which circumstance it derives its name (Greek, "honey"). It is brittle, translucent (at least in thin layers), and distinctly pleochroic. It has a hardness of about 5 and a specific gravity of 3. The mineral occurs in basic emptive rocks and is also observed, quite frequently, in the slag from furnaces. It is sometimes called mellite

MELILLA, Africa, a port of Spanish Morocco, about 150 miles east of the Stratt of Gibraltar Iton ore is mined and exported. A Spanish military command is located there, a wireless station and an aviation corps, the latter having a range of 320 miles. It has been used by Spani also as a penal settlement Pop. about 60,000

MELILOT, a genus (Mclilotus) of annual, biennial and perennial herbs of the family Fabacca. The species of which there are about a dozen, are natives of western Asia and the Mediterranean region and have become widely distributed in temperate and subtropical climates. They are upright, alfalfa-like plants with small yellow or white flowers which are borne from late spring until flost. The pods are few-seeded and not twisted as in the closely related genus Medicago (q.v.). The two best known species are yellow melilot (M. officinalis), an annual, and white melilot (M alba), a perennial, which are common weeds in waste places, the former especially upon dry, clayer soils, the latter in damp situations Like other members of the genus they are sweet-scented, particularly while drying, and their flowers are used to some extent for perfumery.

MELINE, James Florant, American law yer and author: b. Sacket's Harbor, N. Y.; d.

Brooklyn, N. Y, 14 Aug 1873 He was graduated at Mount Samt Mary's College, Emmettsburg, Md, and went to Cincinnati, where he was one of the professors at the Athenaum, and, while teaching, studied law. He was also one of the editors of the Catholic Telegraph. After spending some time abroad in study and travel he returned to Cincinnati, was admitted to the bar and commenced the practice of law; later he relinquished his profession and established a banking business, also holding consulates for France and other nations constitutes failed and shortly afterward 1860 his business failed and shortly afterward he enlisted in the Federal army. He served he enlisted in the Federal army. throughout the Civil Wai under General Pope, attaining the rank of colonel, and after the war was for two years chief of the Bureau of Civil Affairs in the third military district. At the end of that time he went to New York and devoted himself to literary work, writing for the Galaxy, the Nation and the Catholic World In the latter periodical he first published the articles controverting Fronde's statements and conclusions in regard to Mary Queen of Scots; these articles, which aroused wide interest, were afterward revised and published in book form under the title 'Mary Queen of Scots and Her Latest English Historian' (1871) He also wrote 'Two Thousand Miles on Horseback' (1867); 'Commercial Traveling' (1869), and 'Life of Sixtus the Fifth' (1871).

MÉLINITE, mā'līn-īt, an explosive employed by the French government late in the 19th century, in charging torpedo shells and in the preparation of rupturing charges for the use of the engineer corps and cavalry in effecting demolitions As originally used it was composed of 70 per cent of pictic acid mixed with 30 per cent of pyroxylin dissolved in 45 parts of acetone. Later it consisted exclusively of fused pieric acid which was poured into the shell when in the molten condition and cast there in such a manner as to leave a central canal in the mass in which the fuse terminated in a mercuric fulminate detonator by which the charge was fired By the use of this fuse the detonation of the charge was delayed sufficiently to allow the shell to penetrate armor and reach the farther side of it before the ex-Mélinite was very thoroughly tested at Bouchet in 1892 to determine the degree of safety that it possesses when exposed to shocks, fire and the accidental rupture of receptacles containing it, and the results were most favorable The name, like that of other explosives, is going into disuse because of the practice of describing explosives by their principal

MELIORISM (Lat., melior, better), the belief that the improvement of the world by human effort is possible, and implying also the further belief that the world is de facto being gradually so improved and that such improvement is a law of evolution. The term was used first in conversation by the novelist, George Eliot, who desired to formulate a via media between the views of optimism and pessimism so prevalent in her day. Sully adopted the term in his 'Pessimism' (1877), since when it has come into general use. By Sully meliorism is described as "the faith which affirms not merely our power of lessening evil—this nobody questions—but also our ability to in-

crease the amount of positive good. By recognizing the possibility of happiness and the ability of each individual consciously to do something to increase the sum total of human welfare present and future, meliorism gives us a practical creed sufficient to inspire ardent and prolonged endeavor. The opponents of meliorism have connected it with the theory of evolution. Evolution by them is presented in a semi-religious light, inasmuch as they believe in a gradual abatement of evil through progressive evolution. This view is not confined to philosophers of this school, however, but is now the view of many agnostics, who unwarily have assumed this unconsciously religious conception of the universe. Consult Fraser, 'Theism'

MELISSA, a plant. See BALM

MELISSUS, mě'līs-ŭs, Greek philosopher: b Samos, about 480 bc. He was the son of Ithagenes, and is said to have been a friend of Heraclitus and to have commanded the fleet opposed to Pericles in 440 bc. in the Samian War Some fragments of a prose work of his, written in the Ionic dialect, have come down and have been collected and published by Brandis and by Mullach (1846) From these he appears to have been a philosopher of the Eleatic school and to have reached more definiteness and consistency than Parmenides. He reasoned that being was eternal, and could not have a beginning, else it would start with non-being; by like reasoning, there can be no destruction of being, for it would have to become another and opposite thing Void he holds to be nothing, which is not, and therefore unthinkable. He concluded that being was incorporeal, because a body has size and parts.

MELITA, měl'i-ta, the island on which Saint Paul, on his voyage to Rome, was cast away This has generally been considered to be the Island of Malta, the ancient name of which was Melita, and one of whose bays has from immemorial time borne the name of Saint Paul; but some critics have attempted to prove that it was an island, the modern Meleda (q v), on the coast of Dalmatia, in the Adriatic.

MELKART (Phænician, "God of the City"), name of the presiding deity of the city of Tyre and of the whole Tyrian nation, namely, Baal (qv), the sun god. He is sometimes identified with the Heracles or Hercules of the Greeks He was the patron god of mariners and the Phænician colonies of the West, in Africa and Spain, were under his protection To him has been ascribed the subjugation of the savage races who anciently peopled these regions and the building of early Phænician towns The institution of order and legislation in these cities was also said to have been his work Many are the voyages which he is related to have made One of his exploits was the rescue of Astarte from the darkness in which the moon had imprisoned her in the West; he afterward made her his wife. For an account of the Temples of Melkart at Tyre consult Jeremias, Tyrus bis zur Zeit Nebukadnezzar' (1891).

MELKITES. See MELCHITES.

MELL, Patrick Hues, American educator: b. Walthourville, Ga., 19 July 1814; d. Atheus, Ga., 26 Jan. 1888. He was educated at Amherst and after teaching for several years was appointed professor of ancient languages at Mer-

cer University in 1842 and was also ordained a Baptist minister in that year In 1856 he was appointed to the same chair in the University of Georgia, and in 1870 he became vice-chancellor, which post he resigned in 1872 In 1878 he was appointed chancellor and in 1880 was elected to the chair of metaphysics and ethics, which offices he occupied at his death. He held several pastoral charges and was president of different conventions in addition to his educational work and published (Baptism) (1852); (Parliamentary Practice) (1868),

Church Polity (1878).

MELL, Patrick Hues, American scientist
b. Penfield, Ga, 24 May 1850; d 15 Oct. 1918 Son of the preceding, was graduated at the University of Georgia in 1871 and was State chem-1st in 1874-77. In 1878 he was called to the chair of geology and botany at the Alabama Polytechnic Institute and continued in that position until 1902, when he accepted the presidency of the South Carolina Agricultural and Mechanical College In addition to his work in the universities he was connected in 1884-1902 with the Alabama Weather Bureau and the Agucultural Experiment Station and the Agricultural Experiment Station and he invented a system of weather bureau signals which has been adopted by the United States Weather Bureau. He published 'Southern Soapstones and Fireclays' (1882); 'Study of Cotton Plant' (1890); 'Life of Patrick Hues Mell, Sr' (1895); 'Biological Laboratory Methods' (1902): etc. (1902); etc.

MELLILITE. See Mellite
MELLON, Andrew William, American
public official. b. Pittsburgh, Pa, 24 March
1855. He was educated at Western Pennsylvania University, now the University of Pittsburgh and entered the banking house of Thomas Mellon and Sons, eventually becoming its president as well as director in many important business and financial corporations. In 1921 he became Secretary of the Treasury in President Hard-ing's cabinet and held the same office under Presidents Coolidge and Hoover. He was responsible for a policy of reduction in the United State's national debt due to the World War. In 1936 he gave his magnificent art collection to the nation together with \$10,000,000 for the erec-

tion in Washington of a gallery in which to house it. D. Southhampton, N. Y, 26 Aug. 1937.

MELLON INSTITUTE, at Pittsburgh, Pa, founded in 1913 by Andrew W and Richard B. Mellon, to provide qualified workers with facilities for investigating the carefular and the control of facilities for investigating thoroughly problems of major importance in the pure and applied sciences and especially in chemistry. The institution is primarily concerned in carrying on broad researches of postdoctoral character supported by persons or organizations interested in such studies. Before establishing the institute the Mellon brothers recognized the utility of scientific research for benefiting mankind by effecting improvements in or otherwise developing technology. They set up the institute for the purpose of extending this assistance to the industries, and the institution soon demonstrated the value of its research procedure, the Industrial Fellowship System evolved by Robert Kennedy Duncan. The founders then decided to broaden the scope of the institute's activities by making available provisions for investigations in the sciences having more definite relation to human welfare, which might likewise add to

technical knowledge. This basic research was begun and the entire program has since been supported generously by the founders and their families. The industrial research of the institute is organized on a contract basis, the problem being set by a person, firm, or association interested in its solution, the scientific worker being found and engaged by the institute, and an industrial fellowship being assigned for a period of at least a year. All results obtained by a fellow belong exclusively to the donor of the fellowship. Since its inception over \$16,000,000 has been contributed to the institute by industrial fellowship donors, and close to \$1,300,000 is being expended annually in conducting pure and

applied science research.

MELLONI, Macedonio, ma-chā-dō'nē-ō měl-lō'nē, Italian physicist: b Paima, 11 April 1798; d. Portici, near Naples, 11 Aug 1854. He became professor of natural philosophy at the University of Parma, where between 1824 and 1831 he taught hygrometry Political events having compelled him in the latter year to expatriate himself, he went to Geneva, where he made several important discoveries respecting the radiation of heat, which he presented in 1833 to the French Academy of Sciences Later discoveries won him the Rumford medal from the Royal Society of London Through the influence of his triends, Arago and Humboldt, he was enabled to return to Italy, and was appointed by the king of Naples director of the meteorological observatory on Mount Vesuvius Among the results of his labors at this institution was the discovery of heat in lunar light, which led to the determination of the analogy of radiant heat to light. Political troubles again interrupted his labors, and for his presumed sympathy with liberal principles he was in 1849 ejected from his post. In 1850 he published the first volume of a work entitled La termocrast, o la colorazione calorifica, containing an account of his theory of the «coloration of hight,» and of his experiments on the diffusion of heat by radiation, and particularly of its transmission through transparent media Subsequently he gave much attention to the study of electricity and combated the conclusions of Faraday with regard to the transmission of currents over submarine wires.

MELOCACTUS, a cactus typical of the tropical American melon-cactus family, Melocactida. It consists of a globose or conical stem, having rows of spines at intervals and flowers at the top on a hemispherical or cylindrical head. There are more than 20 species. M. communis of the West Indies is the Turk's, Englishman's or Pope's-head cactus. The head bearing the flower is red and like a Turkish fez in form.

MELODEON, a musical wind instrument with a row of reeds and operated by keys. The rocking melodeon, known in America since about 1825, was unsightly, tardy in sounding and of harsh tone. Jeremiah Carhart in 1815 conceived the plan of acting on the reeds by suction instead of blowing, and reversed, to this end, the bellows and reeds, inventing the present instrument in 1836. He thus secured prompt sounding and a flute-like quality of tone; "voiced" the note by curving the reeds, and made many other interespents. In a and made many other improvements. In a single year 22,000 of these instruments were manufactured in the United States, and they

were popular until the cheap parlor organ dis-

placed them

MELODRAMA (from the Greek melos, song, and drama, action), originally and properly a half-musical drama, or that species of drama in which the declamation of certain passages is interrupted by music. It is usually a tragedy of common life, filled with surprises, acts of violence and all that excites and sustains the attention of the audience, mixed up with dancing and music and sometimes with scenes of a rudely comic character. Probability is freely sacrificed for the sake of striking situations. The object is to be sensational and to catch the applause of the gallery. See Drama, The.

MELODY, in music, a succession of single

MELODY, in music, a succession of single tones so airanged as to express a musical phrase or thought A solo for one instrument or voice with or without accompaniment is the most

typical example of a melody.

Melody is one of the most comprehensive terms used in music, being properly applicable to as few as two notes or to as many as the entire principal vocal or instrumental part of a com-

position. An example of the first is the motif of woe in Wagner's Der Ring des Nibelungen



On the other hand, the long, exquisitely mournful, unaccompanied solo for English horn in the third act of the same composer's Tristan and Isolde, played ostensibly by the shepherd on the stage (in reality, of course, by a member of the orchestia in the pit), is usually referred to as the shepherd's melody (or the English horn melody) from Tristan. Similarly the long and equally beautiful flute solo from Gluck's Orpheus and Eurydice, popularized by many violinists in a transcription, is universally known as the Gluck melody from Orpheus.

The term is also appropriately applied to a phrase, or portion of a phrase, in a part that has been subordinate to the principal one and which, for a moment, gains importance on account of its greater melodic significance. In concerted music, vocal or instrumental, the highest part is usually the melody, though as stated above, an inner one, or even one in the bass, may temporarily assume it. In polyphonic music all the parts may be

equally melodic

Melody is the outgrowth of the improvised recitative. The early Greek singer, standing before his audiences holding his four-stringed lyre or chelys, plucked a string and recited his poem on that note until fancy impelled him to change it. From this crude ancestor has sprung melody as we understand it today, which with rhythm and harmony (q.v.) form the great trinity necessary for the complete expression of music. Melody is the only one of the three capable of



suggesting enough of the other two to be satisfactory by itself. The folk song of old and the popular song of today may be sung by a single voice without any accompaniment and yet convey a very definite idea of the rhythm and something

of the harmony that would naturally accompany

Melody is greatly affected by the harmony that the composer has wedded to it, and it is owing to this fact perhaps more than any other that composers continue to find it possible to write original music, for with but 12 different notes from which to form a melody it is evident that, even with all the variations that rhythm can add, the melodic material is capable of exhaustion in the enormous and growing number of compositions. The following phrases of melody, especially the first, have no particular suggestion played alone:



But with the harmony that the composers have added they have an entirely different significance,



Motif of Fate, of Die Walkuere-Wagner.

the one of great solemnity and foreboding; the other of harsh cynicism and sneering

It is curious to note that when Wagner's music dramas were first performed, the most frequent denunciation of them made by contemporary critics was that they were "devoid of melody." By this, the critics meant that they missed the catchy "barrel-organ" tunes of the Donizetti, Bellini, and early Verdi school of opera. Some of the same critics eventually discovered that the tissue of Wagner's music was a tapestry of sound woven from much more beautiful melodies it was literally, as the Wagner critic and biographer Henry T. Finck once put it, a case of not having been able to see the trees for the

Henry Gordon Thunder, Conductor, Choral Society of Philadelphia. MELOIDAE. See Blister-Beetle.

MELON-CACTUS, or MELON-THIS-TLE. See MELOCATUS.

MELONS, a popular name for several unrelated plants, but more particularly for two members of the family Cucurbitaceae, the musk-melon (Cucumis melo) and the watermelon (Citrullus vulgaris). The more important other fruits similarly known are the Chinese preserving melon (Benincasa cerifera) of the same family; the melon papaw (Carica papaya) of the family Caricaceae, and the melon-shrub or melon-pear (Solanum muricatum) of the family Solanaceae.

The muskmelon is an annual trailing herb which has been introduced by man into all tropical, subtropical and many temperate climates from southern Asia where it is native. The following are the principal varieties Variety cantaloupensis, the cantaloupes, or rockmelons, which have hard, warty or scaly rinds more or less furrowed, and flesh of various colors from white to red, green or yellow. In the United States the name «cantaloupe» is loosely applied to horticultural varieties of

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other groups. Variety reticulatus includes the nutmeg or netted melons which have softer rinds, sometimes smooth, but usually more or less netted. To this group belong the larger part of the so-called cantaloupes in American markets. Variety saccharmus comprises the pineapple-melons which have very sweet flesh, but are not clearly distinct from the preceding group. Variety inodorus, the winter musk-melons, which have less hairy, lighter-colored vines and foliage and whose long-keeping finits are deficient or entirely lack the characteristic muskmelon odor. This group is less cultivated in the United States than in the Mediterranean region, but because the fruits can be kept until Christmas or later when properly grown, gathered before frost and slowly ripened in a cool, rather dry room, they should become more widely popular where the seasons are long enough to permit their reaching such a stage of maturity. Variety flexuosus, the snake-melons or cucumbers, have very long, narrow, greenish, contorted fruits, prized more as oddities than for economic uses, though often used for making preserves. They are distinct from the snake-gourds which belong to the genus Lagenaria. A variety chito, called orangemelon, melon-apple, garden-lemon and many other popular names, hears orange- or lemon-like almost scentless fruits with white or pale yellow flesh, which is grown to some extent for preserving Variety dudaim, the pomegranate-melon, Queen Anne's pocket-melon, dudaum melon, etc, has small brown and yellow fruits valued solely for their exquisite perfume.

Melons are propagated wholly by means of seeds, which may be sown directly in the field or started under glass upon inverted sods, in flower-pots, berry-boxes, etc, and transplanted to the field as soon as danger of frost has passed. The former method is practised most extensively in the South and in other warm climates where the seasons are long; the latter in the North because the shortness of the season demands that the plants obtain an early The soil best suited to melons is a light sandy loam well drained, well exposed to the sun and well supplied with plant-food. It should be deeply plowed, thoroughly harrowed and kept clean of weeds, especially before the plants are set and until the vines cover the ground. After harrowing, the ground is marked in checks about five feet square and 10 or 12 seeds, or five or six plants, are set in each "hill," from which all but the two or three strongest vines are 1emoved after the insects have had their share. Often, especially upon rather poor or tenacious soils, two or three shovelfuls of well rotted manure is mixed with the earth of the hills to give the plants a little impetus. The fruits are gathered when they will readily separate from the stems, preferably in the early morning.

During the closing decade of the 19th century the demand for highly flavored melons was greatly increased by the apperance in the cast-ern markets of the Rockylord melon, a small fruit grown in Colorado. Its appearance in large quantities drew public attention to numerous other high flavored melons grown in other sections. As a consequence many inferior varieties have nearly disappeared from cultivation. Besides the Colorado melon fields there are large areas devoted to melon-growing in New

Mexico and California New Jersey, Marr. land and Delaware produce immense quantities, the first-mentioned State especially; and the product is consumed largely in the cities of Pennsylvania and New York. The Mississippi Valley States also send considerable quantities

to Northern markets
The watermelon is an annual trailing herb, a native of tropical and southern Africa, whence it has been introduced by man into all tropical, subtropical and many temperate chimates for its watery sweet fruits, which sometimes weigh more than 75 pounds, but usually range between 20 and 50 pounds. The vines are more harry, lighter green, longer running than those of the muskmelon and the leaves are deeply notched, in some cases approaching the compound form Except for a horticultural group of firm-fleshed varieties known as preserving watermelons or more popularly as citions, the watermelon seems to have no varieties worthy the name of sub-species or botanical varieties, and even this group appears not to have received such designation

In general, the watermelon requires the same treatment as the muskmelon, the soil being, if anything, lighter and more sandy, and the distances between hills about double, except for the smaller growing sorts ducing regions are Georgia and Colorado, but the watermelon is grown largely in all the southern States, and some of the short-season varieties as tar north as Michigan and Ontario. The watermelon is more easily shipped than the muskmelon, since the tough rinded kinds may be placed in cars two or more feet deep, the smaller specimens upon the bottom, and shipped long distances. Muskinglons, being more delicate must be barrieled or crated. The fruits are used exclusively in the raw state and have no by-products such as vinegar, sugar, syup or brandy. The rinds, however, when deprived of the hard exterior, are often preserved with

raisms, etc.

Both muskmelons and watermelons are subject to the attacks of several insects, among which the small, black, stuped cucumber-beetle (Diabrotua rattata), the squash vine-borer (Mellitia ceto), the melon-caterpillar (Morgaronia hyalinata), the cucumber flea-beetle (Crepidodera cucumeris), the squash-bug (Anasa tristis) and the melon-louse (Aphs gossipii) are the most important. Tobacco dust and plant protectors are largely used to prevent the attacks of the first, the adults of which feed upon the under sides of the leaves and the larvæ upon the roots. The melon-louse is fought with kerosene emulsion sprayed upon the under sides of the leaves or by fumigation with carbon disulphide. No effective remedy has been suggested for the boter. Arsenical sprays have been recommended for the caterpillars and other chewing insects. Since the insects are believed to spread diseases from plant to plant, melon-growers seek to prevent insect injury as far as possible and practicable. The diseases, of which a large number have been described, are much the same as attack cucumbers, and may be similarly controlled where control has been found possible. Some diseases, as wilt, have defied all tried remedies. This disease generally ruins the vines a week or 10 days before the fruits would be ready to harvest. Many of the complaints as to the

poor quality of castern-grown muskmelons result from the sale of melons that have been gathered from blighted fields

Consult Bailey, 'Cyclopedia of Standard

Horticulture, (New York 1916)

M G KAINS, Crop Expert

MELOPIANO, an invention by which sustained sounds can be produced on a pianoforte It consists of a series of small hammers set into very tapid vibiation by the winding up of a spring Sec Musical Instruments, Mechan-ICAL

MELOS, me'los, MILO, or MILOS, Greece, an island in the Afgean Sca, in the southwest portion of the Cyclades, about 65 miles east of the mainland. Its length, east to west, is about 14 miles and it is about eight miles in extreme breadth; area, 64 square miles It is mountainous, Mount Ilias rising 2,543 feet, of volcante formation, has hot mineral springs and mines of sulphur. The island was once famous for its riches, fertility and population, and com, wine, cotton, oranges and other truits are still grown Sulphur, manganese ore, millstone, gypsum, etc., are exported. Plaka is the principal town and nearby are the ruins of Melos, the ancient capital Kastion is a large village on the north coast. The island of Melos was first colonized by Phoenicians and afterward by Domans. During the Peloponnesian War it was the faithful ally of Sparta till 416 BC, when it was taken by the Athemans and its inhabitants massacred or sold as slaves. From 1204 till 1537 it formed part of the Venetian duchy of the archipelago. At the latter date it was taken by the Turks, with whom it remained till the epoch of Greek independence. Its ancient prosperity is claimed to be due largely to the fact that obsidian was found here, which was quarred and sold for making knives, hatchets and tools In 1820 a peasant discovered here the celebrated statue known as the Venus of Milo now placed in the Louvie at Paris; the Poseidon in the National Museum at Athens was also discovered here. There are numerous interesting archaeological remains, chief of which are those of the Hall of the Mystee on the site of the ancient capital near the village of Khma, and those of prehistoric Phylakopi, which were excavated by the British School at Athens from 1800 to 1899

MELPOMENE, mel-pom'ς-ne, one of the Muses, daughter of Zeus and Mnemosyne. She presided over tragedy and was generally represented as a young woman with vine leaves surtounding her head, and a tragic mask covering her face.

MELROSE, Mass., city in Middlesex County, alt. 55 feet; on the Boston and Maine Railroad; 7m. N. of Boston. The surrounding area is largely industrial Formerly Melrose had a number of factories, but is now primarily residential with few industrial establishments. It has a public library; parks and playgrounds; musical clubs; a soldiers' and sailors' memorial building; and, at the Mt. Hood reservation, an annual winter carnival. Geraldine Farrar (q v is a native of Melrose. First settled in 1629 and originally part of Malden, it became a separate municipality in 1650; was incorporated as a town in 1850, and became a city in 1900. It has mayor and council. Pop. (1940) 25,333.

Consult Drakt, 'History of Middlesex County'; Goss, E. H., 'History of Melrose.'

MELROSE, Minn, city in Stearns County; alt. 1,211 feet; on the Sauk River and on the Great Northern Railroad; 97m. NW. of Minneapolis. The surrounding region is principally agricultural, and creamery operation is prominent among Melrose activities. Doors and sash are made here; also, granite memorials Melrose is a shipping and distributing point on the rail-road. It was settled in 1868, beside a ford in an old trail, was incorporated as a village in 1881, and as a city in 1895. It has mayor and council, and the city owns the systems of water supply, power, and light. Pop. (1930) 1,801; (1940) 2,015.

MELROSE, Scotland, a village of Roxburgshire, on the south bank of the Tweed at the base of the Eildon Hills, two miles east of Abbotsford, the home of Sir Walter Scott, whose 'Lay of the Last Minstrel' gave Melrose and its ruined abbey world-wide celebrity. The village has a population of 2,100. The famous abbey, now the property of the Buccleuch family, is admitted to be the most beautiful of all the ecclesiastical ruins in Scotland. The architecture is in the late flamboyant Gothic style, and the chief remains are part of the nave, the transept, choir and the southern aisle with several chapels, of the abbey church and fragments of the cloister. The church originally was 258 feet long, with a width at the transepts of 137 feet. It was founded by King David I in 1136, destroyed by Edward II in 1322 and rebuilt by Bruce in 1326 It is the burial place of the heart of Robert Bruce, the good Lord James Douglas and the Knight of Liddesdale. It was partly demolished by the English in 1545.

MELROSE PARK, Ill, village in Proviso township, in Cook County; alt 617 feet; 10m W of Chicago; on the Chicago and North Western Railroad. It has some industries, but is mainly residential; many of its people are employed in Chicago and near-by industrial centers. The water supply system is city-owned. Pop. (1930) 10,741; (1940) 10,933.

MELTING POINT, the temperature at which the solid and liquid states of a body can coexist, without the fluid part of the mixture solidifying, nor the solid part melting. The melting point of a body which is crystalline in nature (like ice) is usually quite definite, and a body of this kind, when it melts, passes at once from a state of perfect solidity into a state of perfect fluidity. The melting point of an amorphous body, such as wax or pitch, is often very indefinite; and when a solid of this sort is gradually heated it grows soft and passes into the fluid state by a process which is practically (or even absolutely) continuous The phenomena of the fusion and solidification of amorphous bodies like wax are not yet understood as well as those that attend the change of state of a crystalline body; and it is to be understood that what follows in the present article is stated with particular reference to the crystal-line class of substances, in which the melting point is definite.

In general, solid bodies expand upon melting, the original solid having a greater density than the liquid that results from its fusion. In the case of water, as is well known, the reverse is true, the fact that ice floats in water proving that the water is denser. The fact that the density of a substance changes upon fusion implies (as may be proved by the mechanical theory of heat) that the melting point of the substance cannot be entirely independent of the pressure. This fact was discovered in 1840 by James Thomson, who showed that the melting point of a substance like ice, which contracts upon melting, must be lowered by pressure; while the melting point of one which expands upon melting must be raised by pressure. These theoretical conclusions have since been abundantly verified by experiment. In the case of ice, for example, it has been found by Dewar, that the melting point is lowered by 0.0130° F per atmosphere of increase of pressure, up to

700 atmospheres

When a substance passes from the solid to the liquid state, it absorbs a very considerable amount of heat, which is known as the "latent heat of liquefaction"; and the liquid which is formed cannot be all reduced to the solid state again until an exactly equal quantity of heat has been abstracted from it. When heat is added to a mixture composed of a solid and its liquid (pounded ice and water, for example), it does not merease the temperature of the mixture, but merely causes a certain amount of the solid to melt. This continues so long as any of the unmelted solid remains; each addition of heat merely bringing about a corresponding amount of liquefaction, while the temperature of the mixture remains unchanged. It is only after all of the solid has melted that the further addition of heat will produce elevation of temperature The melting points of compounds undoubtedly depend, in some manner, upon their molecular constitutions, but we have, as yet, no definite knowledge of the nature of the dependence. We know that in a homologous series of organic compounds, the melting points show a strong tendency to increase, as the molecular weights of the members of the series increase; but the change in the melting points is a regular as we proceed from member to member, and no law has yet been discovered which takes the changes fully into account. The melting point of a mixture (such as an alloy) is often lower than that of any one of the constituents, and the effect of the presence of an impurity in a given substance upon the melting point of that substance is often out of all apparent proportion to the quantity of impurity present. This fact implies that in the determination of a melting point it is highly important that the substance under examination shall be as nearly pure as possible. The presence of slight, unrecognized and apparently negligible impurities has sometimes led to entirely erroneous conclusions. In 1860, for example, Kolbe announced the discovery of an acid isomeric with benzoic acid, but having a lower melting point; but Beilstein afterward proved that the substance in question was merely ordinary benzoic acid contaminated with a quantity of chlorobenzoic acid so small as to be barely recognizable by analysis.

For determining the melting point of minerals, the instrument devised by Joly and known as the meldometer, is sometimes very convenient. It consists essentially of a strip of platinum foil, upon which small fragments of the minerals are laid. The platinum is then

gradually heated by the passage of an electric current, until the numeral melts; the temperature of the foil being obtained by a calculation based upon the resistance of the platinum, the observed strength of the current and the rate at which heat is radiated from the foil, as determined by separate observations. This method is especially useful for nuncials which can be had only in small fragments.

The term fusing point is often used instead of melting point, where a high temperature is required to melt. Following are the melting or lusing points of a few familiar elements in degrees F. Mercury, —30.97; ice, 32; potassium carbonate, 1636; sodium carbonate, 1564; salt (sodium chloride), 1472, tin, 419.33; bismuth, 518.8, lead, 621.1, aluminum, 1220, silver, 1760.9; gold, 1045; copper, 1981, inckel, 2646; iron, 2786; platinum, 3248. Melting points of alloys vary widely, and usually are different from those of the component metals. See Freezing Point; Heat; Molecular Throry.

MELTON MOWBRAY, mö'bič, England, an ancient market town in Leicestershire, 14 miles northeast of Leicester, on the right bank of the Wreak, at the junction of the Eye, 105 miles north by west of London. Melton Mowhray is Lamours for its pork pies and Sulton cheese. It owes its prosperity chiefly to being the seat of the Melton Hunt, which attracts the sporting world in great numbers during the winter months, extensive and luxurious hunting establishments being maintained here. Pop. (urban district) about 9,000.

MELTZER, Charles Henry, Anglo-American playweight and journalist b. London, England, 7 June 1853 He was educated in London and Paris, where he became correspondent of the Clucago Tribune and later of the New York Herald, for which paper he traveled over Europe and Egypt. In 1888 he was appointed dramatic and musical critic of the New York Herald, holding that position for four seasons. From 1893 to 1896 he was dramatic reviewer of the New York H'orld, also for seven years New York correspondent of the London Daily Chronicle His experience was utilized as literary associate in connection with a course of modern plays at Carnegie Lyceum, New York, and in Washington, Boston and elsewhere. In 1907 he became musical critic and special writer, in the United States and abroad, of the New York American and the Cosmopolitan Magazane. In 1914 he was appointed dramatic critic, New York American. Among his plays are 'The Story of Rodion the Student' (onginal, founded on Dostoievsky, novel); 'Manon Lescaut? (original, founded on the romance of Abbé Prévost); 'The Eirst Duchess of Marborough' (original, historic comedy); besides English versions of 'Hannele' (Hauptmann); 'Mme. Sans Gène' (Sardon and Moreau); U.A. Linguis (C. Sardon and Moreau); (L'Arlesienne) (Daudet); 'The Sunken Bell' (Hauptmann); and a farce, 'His Honor the Mayor' (with A. E. Lancaster). From 1902 to 1907 he was secretary and librettist to the management of the Metropolitan Opera Company. He made English versions of 'Das Rheimgold'; 'Die Walkure'; 'Königskinder'; 'Les Contes d'Hoffmann'; 'Das Heimehen am Herd'; etc. D 14 Jan 1036 etc. D. 14 Jan. 1936.

MELTZER, Samuel James, American physiologist: b. Russia, 22 March 1851; d. 7

Nov. 1920. He received a general education at Konigsberg, Prussia, studied philosophy and medicine at the University of Berlin 1875-82 and removed to the United States in 1883, after which he practised his profession in New York From 1906 Dr. Meltzer was the head of the department of physiology and pharmacology at the Rockefeller Institute for Medical Research and consulting physician at Harlem Hospital. In 1917 he was commissioned major in the Medical Reserve Corps. Dr. Meltzer was a member of many medical and surgical societies. He published over 200 papers on biology, physiology, scientific medicine, etc.

MELUSINA, měl-oo-si'na, or MELU-SINE, in French myths, a beautiful nymph or fairy, who is represented as the daughter of Helmas, king of Albama, and the fairy Persine, and as having married Raymond, Count of Toulouse, who built the magnificent castle of Lusignan. Like most of the fairies of that period, she was doomed to a periodical metamorphosis during which the lower part of her body assumed the form of a fish or serpent. On these occasions she exerted all her ingenuity to escape observation; but having been once accidentally seen by her husband in this condition, she swooned away, and soon afterward disappeared. Her form is said to be seen from time to time on the tower of Lusignan, clad in mourning and uttering deep lamentations. Her appearance was believed to indicate an impending calamity to the royal family.

MELVILLE, mel'vil, or MELVILL, Andrew, Scottish reformer: b Baldovic, near Montrose, Forfarshire, 1 Aug 1545, d. 1622 He was educated at the grammar school of Montrose and the University of Saint Andrews; studied two years (1564-66) at the University of Paris; went to Portiers to pursue his studies in the law; there became regent in the College of Saint Marceon; and through the influence of Beza received an appointment to the chair of humanity in the academy of Geneva. Returning to Scotland in 1574, he was at once appointed principal of the University of Glasgow, and in 1580 was made principal of Saint Mary's College, Saint Andrews. In 1582 he presented a petition to King James against the undue interference of the court in ecclesiastical affairs, for which he escaped imprison-ment by going into England. Returning in 1585, he resumed his duties at Saint Andrews, and was moderator of the General Assembly in 1587, 1589, 1594 In 1606 he was summoned to London by the king to confer on Church matters, but because of his outspokenness he was committed to the Tower, and there remained until 1611. He was then released upon the solicitation of the Duke of Bouillon, retired to France and became professor in the university at Sedan, which, according to some accounts (others say London), was the place of his death. Consult 'Lives' by McCrie (1819); Morrison (1900).

MELVILLE, Sir George, British administrator: b Aberdeen, Scotland, 1 July 1842; d. 24 Feb. 1924. Educated privately and at Edinburgh Academy. He entered the imperial service in 1862; and was employed in the colonial civil service from 1874–1905 Between 1899 and 1903 he acted successively as administrator of British Honduras, the Falkland, Ba-

hamas and Leeward islands, Saint Lucia and Windward Islands. He was created K.C M G. in 1900

MELVILLE, George Wallace, American naval engineer: b New York, 10 Jan 1841; d 17 March 1912 Educated Brooklyn Polytechnic; entered the navy as assistant engineer 1861; served through the war; and in 1879 accompanied the De Long expedition on the Jeannette to discover the northeast passage this party he was one of the few survivors; most of the others owed their lives to his indomitable courage and herculean strength - he carried a brother officer, weighing 175 pounds, upon his back, through ice and snow, at the same time superintending all movements of the crew and on occasion helping with the boat He also commanded the subsequent search expeditions which recovered the Jeannette's records and De Long's body In 1887 he was made chief engineer of the navy, a post from which he retired in August 1903, having entirely reformed the service, put navy engineers on a professional rather than an artisan footing, introduced the triple screw on such successful ships as the Columbia and Minneapolis, saved the department a tremendous sum by his refusal to adopt a boiler which had proved unsatisfactory in the British navy and designed 120 ships of over 700,000 horse power. Mclville was made rear-admiral in 1899, and retired in 1903 His book, (In the Lena Delta) (1885), describes his experiences in the Jeannette expedition

MELVILLE, Herman, American novelist: b. New York, 1 Aug 1819; d. there, 28 Sept. 1891 His grandfather was the original of Holmes' (Last Leaf.) His father, an importing merchant, died when Herman was a boy, and in 1837 his education in the Albany Classical School and in New York City having been completed, he shipped as a cabin boy Then he taught school for several years, but in 1841 sailed on a New Bedford whaler, from which in 1842 he made his escape with a comrade on one of the Marquesas. His experiences among the warlike natives and his rescue by an Aus-tralian whaler are described in 'Typee, a Peep at Polyncsian Life' (1846), a great success and an excellent portrayal of life in the South Scas. In 1847 he married the daughter of Justice Lemuel Shaw of Massachusetts; from 1850 to 1863 lived in Pittsfield; was employed in the New York custom-house from 1866 to 1885; and then retired because of ill-health. Melville's writings apart from a few small Melville's writings apart from a few small volumes of verse are mostly taken up with the life of the sailor; some of his better known titles are 'Omoo, Adventures in the South Seas' (1847); 'White Jacket or the World in a Man-of-War' (1850), which effected the abolition of flogging in the United States navy; 'Moby Dick, or the White Whale' (1851), and 'Pierre, or the Ambiguities' (1852). These stories were justly popular. Several "philosophical romances" met with little success 'Batsophical romances" met with little success 'Battle Pieces, and Aspects of the War' (1866) is Melville's best verse His four best romances of the sea were re-edited in 1892 See Moby DICK

MELVILLE ISLAND, (1) an uninhabited island of the Arctic regions crossed by lat. 75° N., long. 110° W., and separated on the

west by Fitzwilliam Strait from Prince Patrick Island Its greatest length is 200 miles; greatest breadth 130 miles. It lies north of Melville Sound, and was discovered in 1819 by Patry, who gave the island its name and wintered there. The formation is mainly sandstone with lime and coal beds. It was visited by Benner in 1908 (2) An island at the entrance to Van Diemen Gulf, off the shore of the Northern Territory of Australia, with an area of about 1,800 square miles. It is hilly and densely wooded, especially with several species of eucalyptus. The earliest British settlement was made in 1824.

MELVILLE PENINSULA, North America, a northeastern projection of Keewatin in the Northeast Territories of Canada, about 400 miles north of Hudson Bay Bounded on the north by Fury and Hecla Strait and on the east by Fox Channel. It is about 250 miles long by about 100 miles broad

MELVILLE SOUND, North America, a channel about 250 miles long by 200 miles broad, extending southeast of Melville Island, and communicating with the Arctic Ocean on the west by Banks' Strait, and with Baffin Bay on the east by Barrow Strait and Lancaster Sound. Much of its contour was measured by Hansen in 1903

MEMBER, a subdivision of a formation (qv) not usually considered of sufficient importance to map separately, but given a separate description or mention in the text of a report.

MEMBRANE, in anatomy and physiology, a thin sheet-like tissue, more or less elastic, varying in structure and vital properties Membranes absorb or secrete fluids, connect certain parts of the body, separate, envelop or form certain organs or act as partitions between two fluids or gases, permitting them to mingle. Mucous membranes line the canals, cavities and hollow organs which communicate externally by different apertures on the skin; for example, the digestive, respiratory and genito-uninary tracts. These membranes are soft and velvety and have on their free surface cells for absorption or motion and in their substance follicles which secrete mucus for lubricating and other purposes. Such secretions are saliva, gastric juice and pancreatic juice. Serous membrances, such as the pentoneum, pleura, the unicæ vaginales and pericardium, facilitate the motion of the organs they envelop (abdominal digestive organs, the lungs and heart) by reason of the serum they secrete, and also maintain the shape of these organs. Allied to the scrous membranes are the synovial membranes lining movable joints. By reason of their smoothness and by aid of their lubricating serum the ends of bones move readily upon one another. Fibrous membranes (for example, periosteum, dura mater and perimysium), not moistened by any particular fluid, augment the solidity of organs they envelop, retain them in position, favor their motion and form canals and rings for the passage of different organs. The membranes which envelop the brain and are extended to cover the spinal cord are called meninges. (See Meningitis). The membranes enclosing the fetus are called the placenta (q.v.). Other special membranes are Descemet's membrane, which is the fourth layer of

the cornea of the eye, and Bowman's membrane, which is the second

MEMBRE, mon-bia, Zenobius, French missionary in America b Bapaume, France, 1645, d. Fort Saint Louis, Tex, 1687 He be-He became a member of the Recollet Order; was sent as a missionary to Canada in 1675, accomnamed La Salle in his western expedition; was with Tonti at Cièveccetti, where he helped bring about peace between the Iroquois and the Illinois, in 1082 went down the Mississippi with La Salle, and in the same year returned to France For a time he was warden of a convent in his buthplace. But in 1684 he set out again with La Salle for the mouth of the Mississippi He was left by La Salle at Fort Saint Louis and there massacred by the Indians. He wrote a description of his trip down the Mississippi, which was incorporated by his cousin, Christian le Clerq, into his Etablissement de la Foi dans la Nouvelle France (1691), and which was later unscrupulously copied b. Hennepin (q v). This narrative has sometimes been attributed to La Salle.

MEMEL, mā'mël, or KLAIPEDA, a seaport at the north extremity of the Kurisches Haff, at its opening into the Baltic, 70 miles north by east of Konngsberg. It belonged to Germany but under the Treaty of Versailles was ceded to Lithuania to Feb 1923. It was almost wholly destroyed by fire in 1854, and was rebuilt in modern style. It has a large harbor, and exports from Lithmania and Russia great quantities of timber, also flax and linseed, coal, manure, grain and herring, has also manufactures of brandy, soap and chemicals, sawmils, iron foundries, breweries and slip-building yards. Menicl was founded in 1252 by the Livonian order, who gave it to the Teutonic Knights, by whom it was fortified in 1404. It suffered severely in the Lithuanian wars (13th and 15th centuries). Here in 1807 Frederick William III of Prussia took refuge and a freaty with England was signed Seized by Russia in 1812 and 1914, but on each occasion that country was obliged to give it up. It was surrendered to Germany by Lithuania on 22 March 1939

MEMLING, or MEMLINC, Hans, Flemish painter: b Mainz, about 1430, d Bruges, 1495. He settled at Bruges 1478, of which town he was a prosperous citizen until his death. While all that is handed down of his biography is apocryphal, it is evident, from his works, that he was an imitator of Roger Van der Weyden, although he avoided the haishness and ungraceful drawing of that artist's style. He stood alone among the Flemish painters of his day: in the religious tenderness of his pictures, their life like expression, their exquisite coloring and modeling. His chief works are to be found in Saint John's Hospital Bruges, namely, the altarpiece, (Mariiage of Saint Catharine) (1470); (Portrait of Maria Morcel as Sybilla Persica) (1480), and the 14 scenes illustrating the legend of Saint Ursula and the 11,000 Virgins of Cologne (1589). In the Academy of Bruges is a triptych of his in the central panel of which are Saints Christopher, Maurus and Ægidius, and on the wings, Burgomaster Morcel (who offered the picture) with his family. In the Royal Gallery at Tmin is his (Seven Dolors of Mary)—a passion picture; in the Pinakothek at Munich a compan-

ion picture, 'The Seven Joys of Mary.' Consult Michiels, 'Memline, sa Vie et ses Geuvres' (1883); Wauters, 'Sept Etudes pour Servir à l'Histoire de Hans Memline' (1894)

MEMMI, měm'mē, Simone. See Martini,

MEMMINGER, měm'min-jer. Christopher Gustavus, American politician, secretary of Treasury in the Confederate government b. Wuttemberg, Germany, 17 Jan 1803; d 7 March 1888 He was brought to America in March 1888 infancy, and was educated at South Carolina College. He studied law; began to practise in Charleston in 1825; entered politics as a leader of the Umon party; attacked the States' Rights party in a sature called 'The Book of Nullifica-(1832); reformed the public school system of the State, and for 20 years was in the State legislature, much of the time acting as head of the finance committee. In 1859, after John Brown's raid, he was commissioned by South Carolina to consult with other delegates in Virginia as to the best method of waiding off attacks of Abolitionists From the formation of the Confederacy until June 1864 he was Secretary of Treasury, and his mistaken policy in that office did much to ruin the Confederacy financially.

MEMNON, in Greek mythology, the son of Eos (Dawn), an Ethiopian prince, nephew of Priam, for whom he fought at Troy After he had killed Antilochus he was defeated by Achilles. The post-Homeric legend adds that his mother wept bitterly for him, even after he had been made immortal. Memnon's kingdom was localized on the west bank of the Nile, and one of the colossal statues of Amenhotep III, as early as the 1st century AD, became connected with the myth. It was said to portray Memnon, and the musical note emitted when the sun's rays struck the statue in the early morning (probably due to the action of sudden heat on the chilled damp stone) were explained as Mennion's greeting to his mother. The statue, rehabilitated by Severus, is still sonorous. The name Mennionium was applied in the Ptolemaic period not only to the west bank of the Nile, as "Memnon's land," but to a temple near Abydus, excavated by Mariette in 1859, which contains the famous "gallery of kings" This has a list of 76 Egyptian kings, and dates from the time of Seti I and his son, Rameses II. This Mennonium contains many other important sculptured documents.

MEMOIRS OF CARLO GOLDONI ('Mémoires de Carlo Goldoni'). This work is celebrated among the many of this class in literature, and yet, in a general way, is comparatively little known The 'Memoirs' were written in French, when Goldoni was 80 years old, and first appeared in Paris in 1787 (3 vols) An excellent edition, reproducing them entire and accurately, was published on the second centenary of the author's birth 1907, by the Florentine firm Barbèra, edited with Italian notes by Guido Mazzoni. It was in 1760, a year before Goldoni was called to Paris, that he conceived, as he states in the preface to the 'Memoirs,' the idea of an autobiography. On seeing that the first Florentine edition of his plays had become the subject of universal pillage, no less than 15 editions having been

published without his knowledge and very incorrectly, he resolved to publish a second edition at his own expense and insert in each volume a part of his life, imagining that in this way the history of his person and his plays might be completed together Moreover, it occurred to him that possibly a collection of his works might some day be discovered in a corner of some old library and awaken curiosity to know something about the writer who undertook to reform the Italian theatre and wrote 150 comedies of character and intrigue. But as the years rolled on and the work which was to extend to 30 volumes and become completed in eight years had only reached the seventeenth volume, Goldoni realized that his project would not be completed during his life. So setting to work six years before his death, abridging and translating into French the contents of the historical prefaces of his 17 volumes of the Venice edition of the plays which related mostly his early life, and continuing with an account of the reformation of the Italian theatre, due largely to the author's theatrical genius, he completed the first part of the 'Memoirs'. The second part gives an account of the composing, construc-tion and outcome of his many plays, together with the criticism of them and rivalry excited by them The third and final part of the 'Memoirs' relates the author's personal experiences in France from 1762 to their close ın 1787.

The 'Memoirs' of Goldoni have been called his most amusing comedy and pronounced by no less a literary light than Gibbon, "more truly dramatic than his Italian Comedies" They have been the subject of admiration of some of the most distinguished of litterateurs not only in Italy but in England, France and Germany, is proven by such testimony as that of Byron, Voltaire and Goethe But to appreciate and enjoy Goldoni's entertaining personal rem-iniscences, no such extraordinary literary talent is necessary,—far from it, for the average reader can hardly fail to get enjoyment from them, especially if he be at all interested in 18th century life in Italy. As a faithful picture of the life of this period, especially the life of the humbler classes, the 'Memoirs' of Goldoni rival his plays and are unexcelled. The parts that relate to Venice, Chioggia and to life in the Italian cities where Goldoni had his many and varied youthful experiences have that genuine ring found in his best plays in Italian dia-lect depicting life among the common people. The portions relating to the author's life in France, although far from lacking in interest, have not the charm that the parts of the 'Memoirs' have which relate to Italy. There is an English translation of the 'Memoirs' by John Black (2 vols, London 1827). The same, abridged and edited, together with a luminous introduction by William Dean Howells (Boston 1877). For everything concerning Goldoniand 1877). For everything concerning Goldoni and his works, consult H. C. Chatfield-Taylor's masterly work 'Goldoni, a Biography' (New York 1913).

JAMES GEDDES, JR.

MEMORIAL ARCH, an arch usually built across an avenue or street, or at an entrance to a park, garden or other public place, to commemorate some person or event. The

Washington Arch in Washington Square, New York City, is a well-known American example of the memorial arch lt is built of marble and is adorned with elaborately carved figures

MEMORIAL ARCHITECTURE. SEPULCHRAL ARCHITECTURE

MEMORIAL DAY. See DECORATION DAY.

MEMORY IN ANIMALS is to be studied in the light of comparative psychology, as between the human and the animal mind To one class of thinkers this difference seems only one of degree; the mind of the animal to them is of the same nature as that of man, but is less developed by reason of limited experience, lack of stimulus because of comparatively small means of intercommunication of ideas, and general inferiority in complexity of brain structure. To another class of thinkers there is an essential difference - a permanent gulf between the mental processes and powers of brute and human beings Memory is one of the most important attributes of mind and must vary with varying mental abilities. Thus it is haidly, if at all, perceivable in animals of low organiza-tion, but is more and more recognizable as we ascend the scale of animal organization, until at the top its operation is clearly visible. studying it as regards animals we are met, however, with this initial and constant difficulty, that while we are able not only to question ourselves and report what we find for comparison with and discussion of the selfexamination by other men, we cannot see into an animal's mind and must judge of its processes by their outward signs. Thus we may assure each other that we possess imagination, which is a high function of memory; but how are we to discover whether an animal indulges itself in such a mental exercise? When a horse goes slowly and with hanging head on an outward journey but becomes instantly animated and brisk in his gait when he is turned toward home, is that because he pictures in his mind the comfortable stable and good food awaiting him? If so, is that not an example of imagination? It has been customary to attribute all such acts as nest-building and the like to "instinct," but innumerable examples of both faulty and beneficial work of this kind discourage faith in so simple a solution; and when a bee ingeniously stays a falling comb by a new brace or guy of wax, or a beaver over-comes a change in his pond by altering the direction of his dam or by building another in a new place, must these creatures not exercise imagination in order to plan and carry out the new way of meeting an unexpected diffi-culty? Each is applying his experience, recalled by memory, in the way he pictures (must picture) to himself the result of what he purposes to do, or he could not carry out his intention. That the animals we know best, horses, dogs, cats and so forth, have a very retentive memory, at least in certain directions, every one knows. The theory of many students of the matter is that this is purely "associative," that something they see or smell or hear recalls a group of facts connected with it; and that it is impossible for them to recall this group without such a concrete suggestion. Much evidence may be produced throwing doubt on this limitation of their power.

ERNEST INGERSOLL.

MEMORY AND ITS DISORDERS. Locke has defined memory as "the power the mind has to revive perceptions which it once had, with the additional perception that it has had them before" Ribot distinguishes three functions of memory (1) the preservation of certain states, (2) their reproduction and (3) their recognition. In view of the fact that the collection of gray matter in the cerebro-spinal axis below the cortex is capable of storing impressions and that probably all parts of the sensory nervous system are concerned in mind action and in memory, it will be necessary to speak not merely of memory but of memories, in the sense of reproductions of like sense quality with the original impressions Modern psychology accepts the concept of unconscious memory, which would imply that all impressions upon all sense organs are permanently retained in the organism. In this case the question is not so much how we remember as why An answer to this question has we forget been found by the present day analytical psy-chology of the unconscious. Up to the time of the acceptance of these views the determinants of memory were considered to be frequency of repetition of the stimulus, or its intensity, or its interest or a combination of these factors. From a purely mechanical point of view memory is interpretable as a result of a biochemical phenomenon. The sensory nerve cells, being acted on by certain stimuli, whether of touch, taste, hearing or sight, undergo certain molecular changes Repetition of similar impulses induces similar reactions and a habitual response in the affected cells results. A line of least resistance is established and in these habitual responses the germ of the idea of memory is to be found.

From this point of view the nerve-cells retain something as a result of a previous ex-perience, and the repotition of the stimulus finds the cells in a receptive state. Continued repetition of the stimuli constitutes a memory, and in this sense the training of a certain mechanism has bound up in it this mechanical theory of memory. Thus a muscular effort, as in tennis, or skating, or piano-playing, becomes by repetition remembered in automatic action, frequently without consciousness. It is the usual rule that many muscular acts which in their acquisition have called for conscious memories soon become automatic, and the effort no longer rises into consciousness, perhaps because of its diminished intensity. A similar point of view may be held for sound-impressions, for taste, for touch, for sight, in each individual case a different series of nerve-cells and nerve-fibres being involved. Thus the and nerve fibres being involved. Thus the memory for a poem may mean a habit-response to a series of sight or sound impressions, or of the muscular memories of the speech mechanism that has learned to repeat the phrases. The actor who automatically says his lines, often not conscious of what he is saying, the pianist who mechanically plays, or the golfer who un-consciously drives true, all show the same class of memory adaptations, involving different nervous chains.

There are thus not only a visual memory, but an auditory memory, or memory for sounds, a gustatory memory for tastes, an olfactory for smells, and special memories for the other special classes of sensation. Older psychology

was concerned with the question as to the fidelity and longevity of these special memories or types of memory, as related to each other, and with the discovery of laws according to which they might be revived (See MNFMONICS) But with the introduction of the unconscious as a dynamic factor, the recalling of a previous experience is explained on a new principle. Memories are thus seen in the form of ideas to be reproduced into consciousness by virtue of forces which are mainly unconscious, and over which consciousness has only an indirect control, and the study of memory as such retires to an importance secondary to the study of the causes why some things tend to be remembered and others tend to be forgotten. tiend or tendency on the one hand to be forgotten or on the other to be remembered is now known to be determined by the unconscious wish, a force which is termed the hbido and which is the prime mover, although uniformly unrecognized, of all the activities of the ego, both conscious and unconscious

The mental mechanisms by which the unconscious pervades and indirectly controls all the conscious expressions, whether activities or thoughts, will be discussed under the title PSYCHOANALYSIS In connection with memory it is necessary here only to point out that what we remember is only the residua after the work accomplished by the processes of repression, during which most of our former experiences are forgotten. On the fundamental principle that what is unpleas-ant in experience is from earliest infancy rejected by the individual ego, and regarded as if it did not exist, we may regard the ego as similarly rejecting or repressing the memories of impressions associated with the unpleasant or painful incidents. This explains why some things are forgotten and others are remembered. The unconscious, which functions solely on the principle of accepting or striving for the pleasurable and rejecting or repressing the painful, therefore furnishes the motive force for injecting certain ideas into consciousness, and restraining other ideas from entering. On this fact depends the further phenomenon that the dynamic factor called the libido, in becoming attached to certain ideas which are thrust out of consciousness, may be converted and its force applied to vegetative functions of the body producing in many cases certain forms of disease. See Medicine and Psychiatry.

Memory, however, does not depend on repetition of stimulus alone. There are variations in intensity and duration of stimuli, modifications in plasticity of the nerve-cells themselves, the quality of attention, and above all the native individual character of health of the nerve-tissue itself—all of which factors enter into the every-day variations in memory that are familiar to all. The fixity and enduring quality of the memories of childhood are proverbial, and are due to the great plasticity of the youthful nerve-cells, as well as to the intensity of the early pictures. That one person should have a good visual memory and a poor auditory memory, and vice-versa, must naturally be interpreted as due to variations in individual capacity. Modern pedagogy has slowly recognized these variations, and the greater prominence given to play, and to methods of precision, be they manual, lingual, auditorial or visual, and less to

distinctly formal methods of memorizing as a purely visual process from a printed page, may be regarded as evidence of this wider recognition that memory should be a generalized function, and not a pedantic cramming of any sort. A well-trained muscular system may be of far greater use to a man than any of his acquired knowledge. It is impossible to train certain children to do certain things, whereas in other directions training may result in great proficiency.

Disorders of Memory.—The classifications of disorders of memory into those of defect and those of excess is based on the old psychology which laid most of the defects to lesions in the costex of the brain The newer view, while admitting the loss of memory evinced by the physical defect in the brain or nerve substance. admits also a purely functional deficiency in various memories which is determined by the unconscious wish and is entirely independent of any organic lesion or defect. It is agreed by most psychologists that the native retentiveness in any given individual does not itself alter, although there may be in one individual a finer nerve and brain structure than in another, enabling one to perceive and therefore retain finer distinctions. But the ability to recall at will, which is the essential quality of a good memory in the ordinary sense, is dependent solely upon the proper alignment of the un-conscious wish with the desires of the conscious life, which are determined by the social environment of the individual

The general term for deficiency or loss of memory is amnesia, although this term fails to express the various distortions of memory, the illusions or slight absences; and there are no technical words to distinguish temporary permanent, periodic or progressive stages of the amnesic process. Inasmuch as memory is not one thing, but a great assemblage of processes which reflect a vast variety of psychological functions, situated not in the brain alone, but almost anywhere in the nervous system, a "defect in memory," as defined by Jastrow, "is an expression of the incapacity of a group (or of certain groups) of centres to exercise their normal functions; or a tendency which they show to functionate in an abnormal manner." Defects of memory may be general or special. General defects may be due to an incapacity on the part of nervous centres to establish residua. This type is found in those people who never remember what they see, and, notwithstanding frequent repetition of an act, never acquire proficiency in it. Occasionally a reverse general condition is manifest wherein the power of memory is unduly exalted and impressions of past experience reappear with unusual brilliancy. Such states are known in fevers, in intoxications of various kinds as of alcohol, opium, etc, and in the hypnotic trance. Special defects may arise in which particular isolated experiences are cut out of the mind. Thus alcoholic amnesia, that may forget even a committed crime, is an illustration Somnambulism and other hysterical states are characterized by defects of this special type. Another form of defect is observed when associated memorygroups are blotted out, as in the special dis-order aphasia. (See APHASIA; SPEECH, DE-rects of). Memory may be falsely localized in time, or in order; imaginary additions to

real events may be present; or illusory remembrances of what has never been experienced occur. Disorders of memory are never primary conditions but depend upon either the physical nerve or brain defect for which there must always be a corresponding deficiency in memory or upon the psychological conditions referred to above, where the specific memories are inhibited by associations with unpleasant or painful situations Through the technique of psychoanalysis a great amount of forgotten material can be restored to memory by means of living over again the situations in which occurred the events responsible for the apparent obliteration of the memory

Psychologically considered, memory defects

may occur either in the storing or retentive part of the nerve-cells, or they may involve the much more complicated and associated process of reproduction of the retained images. Both processes may be involved at the same time. In imbeculty, idiocy, dementia, etc., a born or acquired loss of retentive power is present. In planests — for example, Paderewski — or chess players — Morphy, Pillsbury, etc, a state of localized hyperamnesia is present would include all such produges — Occasionally one sees these two groups represented in one individual, as in an imbecile who has great power for mathematical calculation, etc. A case of this kind proves that the old assumption of closely localized memory-centres is false. Memory may be said to testde in all parts of the sensory nervous system in another group the ordinary annesias may be placed. These vary with each individual and depend largely on the healthy tone of the nervous system in another productions. tem. A third group would include the paramuesias, or illusions of memory. In this condition (1) there is a loss of distinction between memory of things which really did happen and an imagination of things which never did or could The so-called "constitutional har" is an example of this inability to distinguish between real and imaginary, and many types of insane persons are similarly affected in an extreme degree. The reverse of taking an imagination for a real through (2) taking an imagination for a real thing is (2) taking a real thing experienced for the first time as a memory of something experienced before—thought of having seen, heard or felt "just that same thing before," also called "deja vue." Such a feeling has nothing to do with native retentiveness, but only with the "feeling of familiarity," which is essentially the presence of an organic sensation which is absent in the simple paramnesia. In some insanities this form of double memory is very prominent and leads to the belief on the part of the person so affected that he is prophesying when he is only recalling what he experienced before. (3) There is also an associated paramnesia in which things actually experienced suggest ideas falsely taken as memories of other things never experienced. This condition is seen in children and often leads to false testimony. It is also responsible for most "presentiments" or alleged antecedent knowledge of what has happened. Examples of such memories of the patients are resident to the control of the patients. memories of the actually non-existent are seen in the stories of faith cures, where all the healing is that of ills that never really existed, save as associated false memories. On these false memories is erected much of the com-

plicated structure of spiritualism, second sight and other similar phenomena See Idiocy; Personality and Its Disorders; Speech, De-FECIS OF; and RETENTIVENESS

Bibliography, Baldwin, 'Dictionary of Psychology and Philosophy', Freud, 'Psychopathology of Every Day Late' (chapter in "Forgettine," 1917), Ribot, 'Diseases of Memory', Guillon, 'Les Maladies de la Mémoire' with full consideration of hyperamnesia (1897) Salher, Troubles de la Mémorre (1892), and Edgell, Theories of Memory (1924). SMILLI PLLY JELLIFFE, M.D.

MEMPHIS, mem'fis, Egypt, an ancient city near the apex of the Nile Delta, 12 mles south of Carro, according to Herodous, founded by Menes, the first king of Egypt. It was a large, rich and splendid city, and the second capital of Egypt. After the fall of Thebes it became the sole capital. Among its buildings the temples of Ptali, Osnis, Scrapis, etc., and its palaces were described as remarkable. At the time of the conquest of Egypt by Cambyses (521 BC.) it was the chief commercial centre of the country and was connected by canals with the Lakes of Meers and Mareotis With the rise of Alexandria the importance of Memphis declined, and it was finally destroyed by the Arabs in the 7th century. In Strabo's time (20 a.n.) it was, in population and size, next to Alexandria, in biblical history it is mentioned as Moph and Noph. The name Memphis is a corruption of Men-nofer, "good abode" Edvist, in the L2th century, describes its remains as extant in his time. Among the works specified by him are a monolithic temple of grante 13% feet high, 12 long and 7 broad, entirely covered within and without with inscriptions, and statues of great beauty and dimensions, one of which was 45 feet high, of a single block of red granite. These runs then extended about nine indes in every direction, but the destruction has since been so great, chiefly for the construction of Fostat, an Arabic city on the opposite bank of the Nile, that although Pococke and Bruce fixed upon the village of Mitrahinch as the site (where prone on a mound are two colossal statues of Rameses II), this was not accurately ascertained until the French expedition to Egypt, when the discoveries of numerous heaps of rubbish, of blocks of granite covered with hieroglyphics and sculpture, and of colossal frag-ments scattered over a space of three leagues in circumference, decided the matter. The views of the great temple of Ptah, the palace of Apis, the sepulchre of the Apis hulls, portions of the White Wall and of pyramids have been identified. Consult Petric and Walker (in Publications, Egyptian Research Active London 1998) count, London 1908).

MEMPIIIS, Mo, city and Scotland County seat; alt. 796 feet; 45m. W. of Keokuk, Iowa; on the Chicago, Burlington and Quincy Ral-10ad. The surrounding area is agricultural and the city is a trade center for its own and adjoining counties, and a shipping point for faim and dairy products, and livestock. There are bitummous coal fields within the county. Pop. (1930) 1,728, (1940) 1,935.

MEMPHIS, Tenn, city, county seat of Shelby County, alt. 274 feet, area, 48.5 square

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miles, on the Mississippi River, is the largest city in Tennessee and the most important commercial center and distributing point between

New Orleans and Saint Louis

Communications. -- Memphis has ten trunk line railroad systems operating 17 divergent rail lines and consisting of the Illinois Central, Frisco Lines, Louisville and Nashville, Nashville, Chattanooga and Saint Louis, Yazoo and Mississippi Valley, Southern Railway, Missouri Pacific Lines, Saint Louis-Southwestern, Chicago, Rock Island and Pacific; and the Mobile and Ohio. Two railroad bridges coan the Mobile and sippi River at this point. One of these is a combined rail and highway bridge—the only toll-free bridge spanning the River between Saint Louis and New Orleans. Memphis is located on nine national paved highways, namely, Bankhead, Lee, Ozaik Trail, Mississippi River Scene, Florida Mid-West, Broadway of Amerrea, Jessesson Davis, Memphis to Bristol, and the Delta Fourteen motor truck lines and five motor coach lines provide inter-city lighway nansport between Memphis and other cities Barge line transportation on the Mississippi reaches all river ports and provides an outlet for export trade through the port of New Orleans. The Federal Barge Line operates between Minnesota and the Gulf, while the Mississippi Valley Barge Line provides through service from Saint Louis and Cincinnate to Memphis and New Orleans Service to the Putsburgh area via the Ohio River is provided by the American Barge Line and the Union Barge Line.

Memphis is one of five cities possessing arport lacilities sufficient to accommodate the largest flying ships under all weather conditions. Service to the Atlantic and Pacific coasts and to the Great Lakes and Gult areas is now provided in addition to service to the Florida Peninsula

Topographical Conditions.—Memplus is located in the center of and serves the most rapidly developing agricultural section of the country. It is the commercial capital of the Mid-South area which embodies Southeast Missouri, Eastern Arkansas, Western Kentucky, and Tennessee, Northeast Alabama and the northern half of Mississippi. The center of cotton production is some 60 miles south of Memplus. This vast limterland, some 200 by 300 miles in area, produces cotton, corn, rice, wheat, tobacco, soy beans, dairy products, fruits and vegetables. Considerable impetus has been given to livestock raising in recent years. Within this area are many natural resources from which are procured in addition to yellow pine and hardwood timber, many diverse mineral products including coal, oil, natural gas, ball and kaolin clays, as well as stone and marble.

Industry, Commerce, Banking.—By reason of its location on the Inland Waterways System, the cost of transportation on imports is very low. Memphis handles over 300,000 tons of steel annually. The city has nearly 550 plants engaged in the manufacture of 130 of the 331 types of industrial products classified by the United States Census of Manufactures. Principal among these are automobiles, auto tires and tubes, auto bodies, furniture of many types, plywood and veneer, flooring, lumber, toys, mixed feeds, cosmetics, perfumes, toilet goods, food products, beverages, medicines, pharmaceuticals, batteries, piston rings, structural steel, automo-

bile lifts, brick, roofing, asphalt products, meats, bakery products, bags, soap, mattresses, lubricants, tool handles, golf shafts and blocks, lard, paints, electric signs, shuttleblocks, pulp for viscose rayon, cottonwood oil, railroad forgings, iailioad brake shoes, sheet metal pioducts, iron and steel castings and many other commodities. The total Memphis business is valued at approximately \$1,750,000,000 yearly The city controls a primary market 300 miles long and 200 miles wide. This market includes nearly 20,000 retail outlets, about 3,000,000 consumers. Its secondary market as an outlet for manufactured goods includes the entire South from the Atlantic coast to El Paso, Tex, an area of which it is the approximate center and which it serves by radiating lines of rail, federal highways and the Inland Waterways System Memphis has some of the strongest strictly wholesale firms in the country in dry goods, hardwaie, drugs, mill supplies, groceries, electrical products, and agricultural implements. In addition to lines carried by wholesalers over 600 nationally known manufacturers maintain their own warehouses or sales offices in Memphis

In addition to a branch of the Federal Reserve Bank, there are eight parent banks in the city with two branch banking houses. The total resources of these institutions is close to \$200,-

000,000

Public Improvements.—In recent years many improvements have been effected. These include great housing projects and the elimination of slum areas, the erection of Crump Stadium with a seating capacity of 25,000, Riverside Drive along the banks of the Mississippi, a public grain elevator, the elimination of grade crossings, etc. A new pumping station has doubled the city's water capacity. Buses have replaced the more cumbersome trolleys on a great part of the more important transit lines and new routes have been added. In 1939 Memphis completed negotiations for the purchase of the Memphis Power and Light Company, and immediately TVA power was brought to the entire city and power rates have been reduced an average of 37.9 per cent.

Port Facilities.—Memphis has a total of 788 miles of water front on the Mississippi and Wolf rivers. Memphis has municipally owned liver terminals, including a package car terminal, carload terminal and river and rail grain

elevators.

Civic Conditions.—The city is well laid out, and its further development is guided by a City Planning Commission. The wide, well-shaded and well-paved streets, the fine public and private buildings, the parks with numerous large trees, all make the city most attractive. Shelby County, in which Memphis is located, has 3,200 miles of paved and improved roads. Memphis has 408 churches representing all leading denominations. Its superior educational advantages include the colleges of pharmacy, dental surgery, medicine and school of nursing of the University of Tennessee, the State Teachers College, Southwestern College, the William R Moore School of Technology, and the LeMoyne College for Negroes. LeMoyne is the center of cultural life for the colored people. Its college preparatory schools include Christian Brothers College, St. Agnes' Academy and College, St. Mary's School, Lausanne School and Miss Hutchinson's School for Girls. Musicai

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education is provided through the medium of the Memphis College of Music, the Memphis Conservatory of Music and numerous private studios Memphis has 57 public schools including seven senior high schools and eight jumor high institutions. There are 18 parochial schools, with an enrolment of 3,380. The public school enrolment is 43,725 pupils. Memphis has 31 public branch libraries, with a total of 277,035 volumes Foremost of these are the Cossitt Library and the Goodwyn Institute Library, the latter being an endowed institution with an

auditorium and lyceum lecture course.

Memphis is one of the foremost hospital centers of the South, having a total of 20 hospitals with 3,569 beds. Notable among these with Class A rating of the American Hospital Association, may be mentioned the Baptist Memorial, John Gaston Memorial Hospital, Methodist, St. Joseph's Crippled Adults and Methodist, St. Joseph's Crippled Adults and Crippled Children's hospitals. In addition to these, a United States Marine Hospital is located here as well as a United States Veterans' Hospital Facility No 88. Memplis is provided with numerous clinics and private hospital institutions, and there are four sanitariums located just outside the city limits

Local welfare institutions include the Anne Brinkley Home for Girls, the Mary Galloway Home for Aged Women, the Sunshine Home for Aged Men, the Tennessee Home for Jicurables, and the Y W C. A. and Y. M C. A. organizations. In addition, the city has three white orphanages and one colored orphanage

The city has a municipal auditorium leading downtown clubs are the Catholic Club and the Rex Club. Other clubs are the University Club and the Nineteenth Century Club, the latter being a club for women. There are several country clubs, private and public golf courses operated by the Memphis Park Commission.

Parks, Public Buildings, etc.—There are 41 improved parks with a total area of 1,421.58

Two of the major parks are connected by a 12-mile boulevard or parkway encucling the city. The largest park is Riverside Park on the east side of the Mississippi River, just south of the city, containing 427 acres, much of which is left in its state of natural beauty. Next in point of size is Overton Park, one of the most beautiful parks of the South, located in the northeastern portion of the city and containing 335 acres. Within its houndaries are located the Memphis Zoological Garden, one of the finest in the nation, the Brooks Memorial Art Gallery, and the Open Air Theatre where some of the finest musical productions are performed each summer season DeSoto Park is named for Hernando DeSoto, Spanish exploier. In this park near a great Indian mound, is a memorial, consisting of a ledge of rough granite with bronze tablets thereon, containing this inscription: «Near this spot Hernando De Soto discovered the Mississippi River in May 1541.»

Recreational facilities are provided through 29 playgrounds, three swimming pools, seven community centers, three golf courses, 19 wading pools, 60 tennis courts, an athletic building for indoor sports, two stadiums and 12 baseball diamonds. The Park Commission has 100 persons on its recreational and playground staff. Of the 12 baseball diamonds, seven are equipped for night soft-ball games, attracting approximately 300,000 per year.

Memphis has many fine buildings including the Custom House and Federal Building, the Shelby County Court House, the Criminal Courts Building and the Central Police Station, all of which are the finest examples of architecture. The city enjoys the distinction of having the largest artesian water system in the world, obtaining its city supply from an mexhaustible vein which runs as far as the Cumberland mountains in Tennessee. The waterworks are municipally owned and operated, with a capacity of 105,000,000 gallons per day and with 595 miles of mains

Modern sanitation methods obtain in its sewer system and \$2,000,000 was expended in 1938 for improvements Shelly County, in which Memplus is located, has one of the finest county hospitals in the United States which provides care for the indigent, sick and aged. Its Penal Farm is a modern institution in point of splendid facilities and methods employed. The Pink Palace Museum houses an attractive and extensive exhibit of mechanical arts. Memphis is the home of the Cotton Carnival. It is also the home of the Mid South Fair, an annual exposition held in September.

History.— The history of Memphis begins almost with the history of the United States It was a landing and tenting place for the early explorers and missionaries. It was the home of the Chickasaw Indians, and the bluffs on which the city is located, 40 feet above high water and 80 feet above low water, have always been known as the Chickasaw Bluffs, Perhaps the first industry in America was established here in 1541 when DeSoto and his band of followers erected a slupyard for the construction of barges and puragues with which to cross the Mississippi River, then seven miles in width. In 1698 the French built forts on the site of what is now the city, and in 1794 the Spannards erected forts at a time when Spain was claiming exclusive right to the lower Mississippi. Some of the foremost men in the United States owned lands in this vicinity and were interested in holding for their own country a right to free navigation on the Mississippi to the Gulf. Andrew Jackson, James Winchester and John Overton sent to Memphis in 1819 a small colony who established the first permanent settlement. In 1826 there were 500 persons in the settlement which was then incorporated as a town, and in 1849 a city charter was granted. The Union and Confederate forces tried to gain possession of the city at the beginning of the Civil War. On 6 June 1862 a Federal fleet under Commodore Davis conquered a Confederate fleet under Commodore Montgomery, thus placing Memphis in possession of the Union forces. General For-rest in command of Confederate forces entered the city in August 1864 and took several hundred prisoners. Memplus has always progressed commercially except during the Civil War, and when visited formerly by yellow fever epidemics. The great growth industrially has come within the last three decades. Its location has made the city a great railroad centre; the surrounding forests made it a great industrial centre; and the alluvial lands of the Saint Francis Basin, Yazoo Delta and the Valley of the Mississippi River will always make it a great commercial centre. In 1855 yellow fever attacked the city, and again in 1867, 1873, 1878 and

1879 The epidemics of 1878 and 1879 so paralyzed the industries of the city that in 1879 Memphis was unable to liquidate the current indebtedness and the charter of the city was revoked The former city was designated by the State legislature as "the taxing dis-trict of Shelby County". The control of the city was revoked. The former city was designated by the State legislature as "the taxing district of Shelby County» The control of the district was vested in a board of public works composed of five members, and a governing council composed of three commissioners. The council instituted the sewerage system, which practically chiminated the recurrence of yellow fever, improved civic conditions, liquidated the debts and in 1891 the place was re-incorporated and again chartered as a city

Population.-The growth of the city may be seen from the Federal census reports. Pop. (1920) 162,351; (1930) 253,143; (1940) 292,942. Only 2 per cent of Memplus' population is for-

eign born and 38.1 per cent is colored.

eign both and 38.1 per cent is colored.

Consult Davis, I. D., History of Memphis and the Old Times Papers (Memphis 1873), most valuable for period prior to 1850; Williams, S. C., Beginnings of West Tennessee, 1511 1811 (Johnson City 1930), objective, excelent background, Abernetiny, T. P., From Frontier to Plantation in Tennessee (Chapel Hill 1932), best history, but ends in 1860, Hamer, P. M., History of Tennessee, 3 vols (New York 1933), covers entire period; Capers, I., G. M. The Biography of a River Town; Memphis Its Heroic Age (Chapel Hill 1939), excellent bibliography of nimary and secondary sources, pages 269-279. of primary and secondary sources, pages 269-279.

MEMPHIS (Tenn), Capture of. At dusk 5 June 1862 the Union flotilla under command of Com C H. Davis appeared near Memphis and anchoicd two miles above the city. The Confederate flotilla, Com. J. E. Montgomery, commanding, was lying at the Memphis levee. At daylight the Union fleet began to drop down toward the city, and the Confederates advanced to meet it. There were no troops protecting the city. The flotillas were composed of the following vessels:

Union	Guns	Confederate	Guns
Benton Louisville Carondelet Caron Saint Louis Oueen of the West Switzerland Monarch Lancaster	16 13 13 13 ram ram	Little Rebel Bragg Beauregard Price Sumter Lovell Thompson Van Dorn	2 3 4 3
	68		28

Besides having more than twice the number of guns, the Union ordnance was much superior to that of the Consederates. The latter, however, made a desperate fight, which finally ended 10 miles below the city, with the result that the Lovell, Beauregard and Thompson were destroyed; and the Little Rebel, Price, Sumter and Bragg captured. The Van Dorn escaped. On the Union side only the Queen of the West was disabled.

Immediately after the fight the mayor, in reply to a summons to surrender, informed Commodore Davis that there were no troops with which to oppose him The next morning detachments from troops under Col C. N. Fitch, which accompanied the fleet, landed and took possession of the city.

General Grant arrived at Memphis 23 June and established the headquarters of the Dis-

trict of West Tennessee. He was recalled to Corinth 15 July and General Sherman was ordered to Memphis, reaching the city 21 July. He restored the mayor and the city government, and made them responsible for civil order. He continued in command at Memphis until his forces left to join General Grant in the final campaign for Vicksburg, having pre-viously participated in the first move against that city.

The raid of Gen. N. B Forrest, of Confederate cavalry fame, into Memphis occurred 21 Aug. 1864. The Union forces and commanding officers were completely surprised and barely escaped capture. Gen. C C. Washburn, in command of the District of West Tennessee; Gen. R. P. Buckland of the District of Memphis, and Gen. S. A. Hurlbut were asleep in the city. General Forrest left the vicinity of Oxford 18 August, with three brigades, making a forced march of nearly 100 miles. A strong detachment rode into the city at 4 o'clock in the morning, running over a regiment of 100-days men on picket, and capturing about 250 of them. This force divided into three and at once surrounded the quarters of the three offi-cers named. Each, however, escaped.

MEMPHIS, Texas, city in Hall County, alt. 2,067 feet, on the Fort Worth and Denver City Railroad, 85m. SE of Amarillo. Cotton processing is its principal industry. Pop. (1940) 3,869.

MEMPHREMAGOG, mem-fre-ma'gog, a lake in the southern part of the province of Quebec, Canada, extending into Orleans County, in Vermont It is about 30 miles long, north and south, and from three-quarters of a mile to three miles wide. It is irregular in shape, and along its shores are several striking indentations, in some places low and in some other parts high and rocky. The land on the west shore is mountainous, the altitude of the highest points being about 2,800 feet. The outlet is the Magog River, which flows into the Saint Francis River. Along the shore are a number of villages, and in summer a steamer plies daily on the lake, connecting the chief towns and villages.

MENA, Juan de, Spanish poet: b. Cordova, Spain, about 1411; d 1456. He was educated at Salamanca and at Rome and afterward was appointed secretary and court historian to John II, king of Castile. His allegorical poems, 'Coplas de los Siete Pecados Mortales,' 'Le Coronacion, and 'El Laberinto' (The Labyrinth), a poem founded on the 'Divina Commedia' and published in the year 1496, all show the influence of Dante, for whom he held great respect and admiration They were very popu-lar, but possessed little literary merit. His collected works were published in 1528, entitled Copilación de todas las obras de Juan de

MENA, Ark, city and Polk County seat; alt. 1,145 feet; 85m. S. of Fort Smith; on the Kansas City Southern Railroad. It is in a summer resort region of the Ouachita Mountains, is a shipping point for lumber, and the business center of a farm area raising cotton, corn, peanuts, soybeans, berries and poultry. It has cotton gins, bottling works, flour mills, and manufactures of wooden handles, slate roofing, headings and staves Pop (1940) 3,510

MENABREA, Luigi Federigo, COUNT, Italian soldier and statesman b Chambery, in Savoy, 4 Sept 1809, d there, 25 May 1896 After completing a course in mathematics at the University of Turin and joining the engi-neers in the Saidinian army, he accepted the professorship of technical science at the military academy and at the University of Turin. Having been promoted to the rank of captain, he was used in the diplomatic corps for some time; was then elected deputy, serving both under the Minister of War and the Minister of the Interior; and upon the outbreak of the war of Sardinia and France against Austria in 1859 he was appointed chief of the engineer corps. After Savoy was ceded to France, Menabrea was made a senator by Victor Emmanuel, and chief of the department of engineers, and as such planned the fortifications of Bologna, Piacenza and Pavia; in 1860 he was created a lieutenant-general, in that year laying stege to and after three months of fighting taking Gæta. In 1861 he joined the Cabinet of Ricasoli as Minister of Marine in 1862 also taking over the portfolio of Minister of Public Works. In 1866 he was Italian ambassador to the council which brought about the Treaty of Prague and ceded Venice to Italy In 1867, when Rattazzi resigned, he formed a new ministry, himself becoming Minister of Foreign Affairs As Premier he did much to place Italy in cordial relations with the outside world, and to settle internal dissensions, but his imprisonment of Garibaldi and the prevalent financial straits of the nation lost to him the confidence of the House of Deputies, and on 16 Nov 1869 he resigned In 1870 he became Italian Ambassador at Vienna, was appointed to the same post at London in 1876 and in 1882 went to Paris, where he was stationed for 10 years. The most important of his works are (Etiudes sur la série de Lagrange) (Turin 1844-47); 'Le genie italian dans la campagne d'Ancone et de la Basse-Italie' (Paris 1866), and 'République et Monarchie dans l'état actuel de la France' (1871)

MENAGE, Gilles, French philologist and satirist. b. Angers, 15 Aug 1613; d Paris, 23 July 1692 After completing his early studies he became an advocate, practising for some time at Paris, but, having conceived a profound disgust for that profession and all its adherents, he became an ecclesiastic, and for some time was a member of the household of the Cardinal de Retz, but subsequently took up his residence in the cloister of Notre Dame A witty satire, entitled 'Requéte des Dictionnaires,' published shortly after this time and aimed at the 'Dictionary' of the French Academy, prevented his becoming a member of that society His most important works are 'Dictionnaire étymologique, ou Origines de la Langue Française' (1650-94); 'Origines de la Langue Italienne' (1669); 'Miscellanea'; 'Remarques sur la Langue Française'; 'Historia Mulierum Philosophorum'; 'Poésies Latines, Italiennes, Grecques, et Françaises,' and 'Anti-Baillet'

MENAGERIE, a collection of wild animals, exhibited in zoological gardens, in museums and by circus companies traveling

from city to city. The term is now confined almost wholly to a collection exhibited in connection with a traveling circus, a permanent collection being styled a zoological park or "zoo". The menagette of the typical circus is usually shown in a separate tent, so arranged that the public can make the found of the cages before taking their scats. The principal exhibits are usually elephants, a graffe (when one is to be had), hippopolamus, thinoecros, tapir, hous, tigets, bears, leopards (and others of the cat family), lyrix, kangaroo, varieties of deer, monkeys, a few cages of snakes, and minor animals. See Circus, Zoological Gardens

MENAI (měn'ī) STRAIT, the channel between Wales and the island of Anglesey, is 13 miles long, and varies in width from 250 yards to two miles. A suspension bridge and the celebrated Britannia Tubular Bridge connect Anglesey with the matuland. The tides and current are very strong at times, so that large vessels avoid the strait. See Bridge

MENAM, mā-nam', or MEINAM, the chief river of Stam, rising in the Laos country, and flowing generally southward to enter the Gulf of Stam below Bangkok. The headwaters are named the Nam Nam. Its length is about 900 miles, and for a considerable portion of its course it is navigable for small craft. It is subject to periodical overflows on which the crops of the rice fields along its banks are dependent.

MENANDER, the name of two Greek writers, (1) the comic dramatist. b. Athens, 342 BC; d there, 290 BC. He was the pupil of Theophratus, himself the pupil and successor of Aristotle as head of the Peripatetics, and author of Characteres,' a somewhat more literary and popular enlargement of some ruling ideas of the Nicomachaan Ethics; he was by such a teacher well trained for his diamatic vocation, He was, moreover, a friend of Epicurus from early life, and may thus have been imbued with that bonhommie which tendered him so genial an interpreter of manners. He wrote a hundred comedies which are distinguished from those of Aristophanes by their refinement, their freedom from personal and political virulence, and their graceful, sometimes beautiful, delinea-tion of feminine character. He was, however, outrivaled in popular layor by his contemporary Philemon, whose ribaldry was irresistable to the Athenian playgoers. Only some fragments of his works survive in the original, the most important of these relies having come to light in Egypt (1898). He was, however, closely intated by Plautus and Terence, and in the Bacchides, 'Stichus' and Poenulus' of the former, and the 'Andria,' (Eunuchus,' Heautontimorumenos' and 'Adelphi' of the latter we have very good representatives of the Greek dramatist's method and spirit A fine antique statue of Menander is to be seen in the Vatican (2) A Greek rhetorician who flourished in the latter half of the 3d century BC. He has left the thetorical treatise 'De Encomis,' and from his analyses of the orations of Demosthenes, most of the scholia on that orator have been compiled. Consult (on Menander the dramatist), Guizot, 'Ménandre' 1855); Horkel, 'Lebensweisheit des Komikers Menander' (1857); (on Menander the rhetorician), Ritschl,

(Der Rhetor Menander und die Scholien zu Demosthenes) (1883)

MÉNARD, mā nar, Michel Branamour, American proficer b Laprairie, Lower Canada, 1805; d. 1856 He was of French parentage, and after working some time for a Detroit furrading company entered the service of his uncle, also a hurtrader, in Missouri. The Shawnees made him their chief, and he acquired great power among various Indian tribes. Soon after 1830 he went to Texas, where he continued by trading with the Indians, and also dealt with Mexicans When the Texans 1evolted against Mexico he held the Indians in check and kept them from acting against the insurgents. As a member of the convention at which the Texans declared their independence, and afterward of the Congress of Texas, he excited an influence in the formation of that State The greater part of the site of Galveston was included in a purchase made by him in 1836, and of that city he, more than any other man, is to be considered the founder

MENASHA, me nash'a, Wis., city and resort in Winnebago County, alt. 755 feet, on the navigable Fox River, at Lake Winnebago, 93m NW of Milwaukee; on the Soo Line, Chicago and North Western, and Chicago, Milwaukee, St Paul and Pacific radioads; immediately adjacent to Nechali with which it torms a continuous community. It has a tannery, printing plants, boiler works and manufactures of paper, paper products, and paper mill machinery, woodenware, pulleys, pumps and wire Menasha and Neenah were settled in 1843 on land ceded to the United States Government by the Menominee Indians in 1836 Menasha received a charter to develop the water power and became the industrial center. Doty Island in the river belongs partly to each city; on the Menasha side, the site of Nicolet's landing in 1634 is marked. Pop (1940) 10,481.

MENCIUS, men'shi-us, the Latinized name of Meng-tse, that is, Meng the Teacher, a Chinese philosopher and recluse: b. province of Shan-Tung, about 372 n.c.; d. there, about 289 n.c. He was educated by his mother with such success that the approbation contained in the phiase "the mother of Meng" has become proveilial. Mencus was one of the greatest of the early Confucians. During his time the governments of China were oppressive, and Mencius for many years wandered about in search of a prince who would consent to govern in accordance with true and just principles. Failing to find any such, he retired to his former seclusion and spent the rest of his life in perfecting his system and training disciples. His works contain some enlightened views on man and He believed in the moral nature of man and had unbounded faith in the possibilities of progress under a good social and political system. He regarded all governments as from God, but at the same time he believed in the responsibility of rulers to their people and the people's right to depose or even put to death unworthy rulers. In a nation the people are the most important element, second comes the government and third the monarch. The aim of a government, according to him, should be the happiness and education of the people, and any ruler who was content to leave his subjects in ignorance and misery deserved to be deposed. The teachings of Mencius were written out by his disciples in dialogue form, under the title 'The Book of Mencius,' which has been translated into Latin by Julien (1824) and into English by Collin (1828) Consult Legge, 'Life and Works of Mencius' (1875); Faher, 'Lehrbergriff des Philosophen Mencius' (1877); Watters, 'A Guide to the Tablets in a Temple of Confucius' (1879).

MENCKEN, Henry Louis. critic and editor, of German, Irish and English extraction: b. Baltimore, Md, 12 Sept, 1880. He was educated at the Baltimore Polytechne Institute, and entered daily journalism in 1899, remaining in active service until 1917. He became literary critic for *The Smart Set* in 1908, and from 1914-23 was a part owner of the magazine and joint editor with George Jean Nathan (qv). His publications include a great many magazine articles and the following books 'Ventures into Veise' (1901); 'George books 'Ventures into Veise' (1901); 'George Benard Shaw His Plays' (1905), 'The Philosophy of Friedrich Nietzsche' (1908), 'Men vs the Man,' with R R LaMonte (1910); 'The Artist' (1912); 'Europe After 8 15,' with George Jean Nathan and W. H Wright (1914); 'A Book of Burlesques' (1916); 'A Little Book in C Major' (1916); 'A Book of Prefaces' (1917), 'In Defense of Woman' (1918); 'Dame' a Book of Calumny' (1918): 'The 'Chamn: a Book of Calumny' (1918); 'The American Language' (1918, new rev ed, 1935); 'Prejudices: Six Series' (1919–27); 'Heliogabalus' with Nathan (1920); 'Notes on Democracy' (1926); 'A Trestice of the Code,' (1920) racy' (1926); 'A Treatise on the Gods' (1930); 'Happy Days,' an autobiography of his first 12 years (1940). He has also edited, with critical prefaces, books by Ibsen, Nietzsche, Brieux and Wilde. Mencken represents the extreme wing of anti-academic criticism in America. He is a critic of life rather than of books, and his burlesques, plays and epigrams are parts of his criticism. He was editor of The American Mercury from 1924 to 1933

MENDAITES. See NAZARENES. MENDEANS. See NAZARENES.

MENDEL, Johann Gregory, abbot of Brunn, now known as the discoverer of the law named after him (see HEREDITY) . b Heinzendorf bei Adrau, Austrian Silesia, 22 July 1822, of peasant parents; d 6 Jan. 1884. In 1843 he entered the Koniginkloster, an Augustiman foundation in Altbrunn, as a novice; and was ordained priest in 1847. From 1851-53 he studied natural science at Vienna; and, on his return to the closster, taught in the Realschule About 1869 he became abbot of Brunn; and later took part in the Ultramontane movement. It was in 1854 that he began those experiments, on Pisum, in the cloister gardens, that, after the lapse of half a century, have brought him posthumous fame In 1865 he contributed his now memorable paper, 'Versuche über Pflanzenhydriden,' to the Society of Naturalists of Brunn; and, in 1869, another, on Hieracium hybrids. After 1869 he seems to have discontinued his work in hybridizing, and died un-recognized by science. This seems inexplicable, as his researches were of a nature to commend them to his studious contemporaries, among them Darwin, who entirely missed his

contribution, even though the Brunn society exchanged with the Royal Society of London But Mendel had the satisfaction of realizing that he had established a law in heredity as to the numerical ratios of the types developed in hybridizing—the grand fact for which we now prize his unobtrusive labors. His theories have given us the word Mendelism—He called himself a student of Kollar; and for some time he was president of the Brunn society—Since the verification of his experiments, simultaneously, in 1900, by De Vites, in Holland, Correns, in Germany, and Tschermak, in Austria, and of the translation of his paper appearing in the Journal of the Royal Horticultural Society of England (1901), the literature has been full of "Mendel's Law"—Consult Baleson, W., "Mendel's Principles of Heredity" (Cambridge 1902).

MENDELEEV, myčn-dyi-lya yčí, Dmitri Ivanovich, Russian chemist b Tobolsk, Siberia, 7 Feb. 1834; d St Petersburg, 2 Feb 1907 He studied at the Institute of Pedagogy, St Petersburg, where he gave attention to nat-ural science; in 1856 became docent at the University of Saint Petersburg; was at Heidel-berg in 1859–61, where he guidelyed his provide berg in 1859-61, where he published his monograph 'On the Capillarity of Gases,' soon followed by 'Organic Chemistry' In 1863 he became professor of chemistry at the Saint Petersburg Institute of Technology, and in 1866 was appointed to a similar professorship in the University of Saint Petersburg. The results of his researches on the compression of gases, which he closely pursued from 1871 to 1875, were set forth in his work 'On the Elasticity of Gases.) He was commissioned in 1876 to report upon the petroleum industry in the Caucasus regions and in Pennsylvania. His 'Aqueous Solutions' (1886), a work on experimental chemistry, has taken its place among the most important contributions to that branch of science. In 1890 his Tariff Elucidated) presented the protectionist views of which he had already become a well-known advocate, and which, as a member of the Council of Commerce and Industries, he actively propagated When the Chamber of Weights and Measures was established by the Department of Finance, in 1893, he was appointed conservator of the weights and measures His proof of the periodic law (q.v.), first presented in 'Elements of Chemistry' (1868-70), is his crowning achievement in pure science Consult crowning achievement in pure science 'Essays in Historical Chemistry' Thorpe, (1894).

MENDEL'S LAW, the law of heredity discovered by Johann Gregor Mendel (qv) and first published in 1865 under the title "Versuche uber Pflanzenhydriden" in the Proceedings of the Society of Natural History of Brünn, Austria Mendel made prolonged experiments in crossing varieties of the pea (Pisum sativum). His paper was overlooked until attention to his remarkable results was called by De Vries in 1900; he and also Correns and Tschermak at the same time independently rediscovered Mendel's law. Mendel selected seven pairs of characters, such as the shape of the ripe seed, of the cotyledons, of the seed-pod, color of the seed-skin, length of stem, etc. Large numbers of crosses were made between peas differing in respect of one of each of these pairs of

characters It was found, says Bateson, that in each case the offspring of the cross exhibited the character of one of the parents in almost undiminished intensity, and intermediates which could not be at once referred to one or other of the parental forms were not found "In the case of each pair of characters there is thus one which in the first cross prevails to the exclusion of the other." This prevailing character Mendel called the dominant character, and to the other he gave the name of recessive character.

This law of dominance has been found by Bateson and by Castle to apply to animals as well as plants, and thus is a most important biological law. Thus when mating occurs between two organisms, whicher vegetable or animal, differing in some character, the offspring frequently all exhibit the character of one parent only, in which case that character is said to be "dominant". For example, on crossing white mice with gray mice, Castle found that the offspring are gray, that color-character being dominant. The character which is not seen in the immediate offspring is called recessive, for though tinseen it is still present in the young, white in the experiment being the recessive color.

The law of dominance has its exceptions; the hybrid often possesses a character of its own, instead of the pure character of one parent, as is true in cases of complete dominance. The hybrid form often resembles a supposed ancestral condition, when it is usually regarded as a reversion. Examples are the gray hybrid mice, which are indistinguishable in appearance from the house mouse, also slate-colored pigeons resulting from crossing white with buff pigeons.

One result of Mendel's discovery is the purity of the germ cells. As stated by Castle"The hybrid, whatever its own character, produces tipe germ cells which bear only the pure character of one parent or the other." To breeders Mendel's law is of great importance because, as remarked by Castle, it reduces to an exact science the art of breeding in the case most carefully studied by him, that of entire dominance. "No animal or plant is 'pure' simply because it is descended from a long line of ancestors possessing a desired combination of characters, but any animal is pure if it produces gametes (germ-cells) of only one sort, even though its grandparents may among themselves have possessed opposite characters."

The hearings of Mendel's discovery, confirmed by De Vries' experiments, on the origin of species are most important. The problem is whether aberrations, sports or discontinuous variations may not sometimes result in the formation of new species and types, or whether species are all the result of slow, continuous variations. As stated by Castle, "A sport having once arisen affecting some one character of a species, may by crossing with the parent form be the cause of no end of disintegration on the part of any or all of the characters of the species, and the disintegrated characters may, indeed must, form a great variety of new combinations of characters, some of which will prove stable and self-perpetuating.

Mendel's discoveries also explain the principle that new types of organisms are extremely

variable, whereas old types are subject to little variation. A new type which has arisen as a sport will cross with the parent form. The offspring, says Castle, will then inherit some dominant character, others latent, and this will result in polymorphism of the race. Thus the suggestion of Galton that species may arise from sports is confirmed, while added cases are afforded by the recent remarkable experiments of De Vites, resulting in the origination of seven new species of primiose by sudden variations, or what he calls "mutations." Consult Bateson, W., 'Mendel's Principles of Heredity' (Cambridge 1913), Castle, W. E., 'Mendel's Law of Heredity' (Cambridge 1903), Morgan, T. H., 'The Mechanism of Mendelian Heredity' (New York 1915). See Tierpotty.

MENDELSSOHN, měn'děls-son, Moses, German Jewish philosopher: b Dessau, Germany, 6 Sept. 1729, d. Berlin, 4 Jan. 1786 father, Mendel, a schoolmaster, though very poor, gave him a careful education. He lived several years on the charity of persons of his own religion, devoting his time to study, chiefly in Hebrew and Hebrew literature, but also in mathematics and modern languages 1750 he was appointed by a silk manufacturer named Bernhard, a Jew, tutor of his children. At a later period Bernhard took him as a partnei in his business. In 1754 he became acquainted with Lessing, with whom he conmatted a close nationary, which had a great influence on his mind. Intellectual philosophy now became his chief study. His Briefe uber die Empfindungen' were the first-fruit of his labors in this branch Mendelssolin contributed to several of the first periodicals, and now and then appeared before the public with philosophical works, which brought him fame, not only in Germany, but also in foreign countries. The most celebrated of these is Thadon, a treatise on the immortality of the soul, first published in 1767 It has been translated into most European languages. He established no new system, but was, nevertheless, one of the most profound and patient thinkers of his age, and the excellence of his character was enhanced by his modesty, upughtness and amiable disposition He knew how to clude with delicacy the zealous efforts of Lavater to induce him to declare himself a Christian. To this encounter between Lavater and Mendelssohn German literature owes one of its greatest dramas, Lessing's 'Nathan der Weise,' in which the author, in the person of the hero, commemorates the virtues, the tolerant spirit and comprehensive mind of his friend Mendelssohn. His Gerusalem, oder über religiöse Macht und Judenthum? (1783) was much mistunderstood, partly because he attacked many deep-rooted prejudices of his race 'Morning Hours' (Morgenstunden) was published in 1785. The last work of Mendelssohn was in defense of his friend Lessing, of whom Jacobi had asserted that he was a Spinozist, was entitled 'Moses Mendelssohn und die Breunde Lessings' (1786). Consolve the street of the sohn und die Freunde Lessings) (1786). sult Kayserling, 'Moses Mendelssohn' (1882).

MENDELSSOHN-BARTHOLDY, Jakob Ludwig Felix, German composer: b Hamburg, 5 Feb 1809; d. Leipzig, 4 Nov 1847. The kindly influences which, like a halo, encircled the life of the illustrious man, are reflected in many of his best compositions. He was born

in prosperity, reared in plenty and at nearly all times was surrounded by conditions conducive to success. It has been said that in no way was Mendelssohn's naturalness and naiveté more evident than in his constant reference to his own foibles; and further, that the hearty way in which he enjoyed idleness and boasted of it were delightful in a man who got through so much work, who was singularly temperate and whose only weakness for the products of the kitchen was for rice, milk and cherry pie "I do not in the least concern myself," said he, "as to what people wish or praise or pay for; but solely as to what I myself consider good."

It is doubtful whether the history of any other great musician discloses so wide a combination of qualities. Some of his biographers have expressed the thought that his happy disposition prevented his work from attaining that degree of depth which it might have done had his genius been subjected to fiery trials. Be this as it may, the fact remains that among all the German composers there is not one who has enjoyed such universal popularity, certainly in America and England, as Mendelssohn His oratorios, 'Saint Paul' and 'Elijah,' are sung 'everywhere, while his 'Hymn of Praise,' the 'Overture to the Hebrides,' his symphonics, sonatas, concert-overtures, settings for certain Psalms and 'Songs without Words' are familiar to all.

Seventy-two of Mendelssohn's numbered works were published before his death and 47 later, while 23 of his compositions, many of them including two or more pieces, had no "opus" numbers assigned to them. Six other of his published compositions have been recorded, while his unpublished pieces, mostly in autograph and principally composed before he was of age, are quite numerous, including 12 symphonies, several fugues, concertos, sonatas, studies, fantasias, etc

Felix was the second child and eldest son of Abraham Mendelssohn, a Jewish banker of Hamburg, and Lea (or Leah) Salomon, a resident of Berlin, and a Jewish lady of considerable property and attainments, to whom he was married on 26 Dec 1804. The grandfather of Felix was Moses Mendelssohn (qv.), who settled in Berlin in 1762 and married Fromet, daughter of Abraham Gugenheim, of Hamburg. Moses' father was named Mendel, a poor Jewish schoolmaster of Dessau, on the Elbe. Thus the name Mendelssohn (son of Mendel) simply perpetuates the Oriental method of namemaking.

When not three years old Felix was taken to Berlin, and five years later (1816) his father took him and his sister Fanny, four years the senior of Felix, to Paris on a business trip. While there they both received lessons on the piano from Madame Bigot, but it was not till after their return to Berlin that their systematic education commenced. Ludwig Berger became their piano instructor and Zelter taught them thorough-bass and composition In 1824 Moscheles became acquainted with the family, and while he declined to accept Felix as a pupil consented to offer him suggestions and advice. In the same year Spohr visited Berlin and renewed his friendship with the family, which had been formed at Cassel in the summer of 1822 where the family had gone for

the purpose of introducing Felix to him In his eighth year Felix played the piano with remarkable ability, and about a year later (1818) he made his first formal public appearance. This was at a concert given by Joseph Gugel, a virtuoso on the horn. At 11 he joined the Singakademie as an alto. In 1820 Felix commenced systematic work as a composer, although before that time he had written from 50 to 60 complete movements. The carbest date of which a dated autograph is preserved was attached to a cantata entitled. In ruhrend feierlichen Tonen, which he completed on 13

January of that year.

The following year was eventful He composed five symphomes, nine Jugues, several pieces for the piano, two operettas and a number of songs It was in this year, too, that he visited Goethe at Weimar The poet was delighted with his talent While at Weimar he played before the Grand Duke and Duchess and improvised before the court and also before Hummel His compositions in 1822 were yery numerous, and during this and the following year he wrote six symphonies, five concertos, a piano quartet, a violin sonata, a Magnificat and Gloria, and an opera in three acts, entitled 'Die beiden Nessen, oder der Onkel aus Boston On 31 March he played for the second time in public, at Aloys Schmitt's concert, taking part in a duo for two pianos, and again, on 5 December, he played at a concert given by Madame Milder-Hauptmann, when he gave one of his own concertos. It was probably in this year, too, that the practice of having informal musical performances on alternate Sunday mornings at the Mendelssohn home was begun. Felix directed, his sister Fanny presided at the piano, his younger brother, Paul, played on the cello, and his second sister, Re-

becca, sang
In 1824 his musical genius showed marked advance, as evidenced in his symphony in C minor, composed between 3 and 31 March. In the summer he was taken to Doberan on the Baltic, a seaside resoit, and there received the impressions which later found expression in his 'Meeresstille Ouverture' His wonderful power of extemporizing and his readiness to play the music of other composers are noteworthy featares, and Hiller, who was with him in Frank-fort in 1825, was carried away with his per-formances. In this year he met Cherubin in Paris, whither he accompanied his father on a visit. Toward the end of 1825 Mendelssohn's father purchased a large mansion, surrounded by spacious grounds, and under the influence of this charming home he became more and more devoted to his work. The beauties of Shakespeare were here unfolded to him Felix was especially charmed with the 'Midsummer Night's Dream, and probably then conceived the idea of the exquisite composition bearing that name which forms opus 61 and was first produced in Potsdam 14 Oct 1843 The overture to a 'Midsummer Night's Dream' appeared earlier, and as a piano duet, its first public per-formance being given at Stettin in February 1827. Either during this or the previous year, Felix entered the University of Berlin, where he showed evidences of decided literary powers On his return from Stettin he made preparations for his opera 'Die Hochzeit des Camacho.' but owing to the opposition of the director,

Spontini, it was performed only once at that time, although, strange to relate, a complete performance of it was given at Boston, Mass, on 19 March 1855

The principal compositions during 1828 were a cantata for the Tercentenary Festival of Albrecht Durer, a cantata for a Congress of Science, an antiphona for four voices, and a concert overture. He also completed his overture to Goethe's 'Calm Sea and Prosperous Voyage'. During this year he organized a choir of 16 voices for practising Bach's Passion The year 1820 was an important one for Hitherto his father had not permitted him to repaid himself as a professional musician, but this now being determined on, arrangements were made for him to visit some of the great capitals, with a view of gaining materials for his greatest works. His first journey was to England, where he arrived on 21 April 1829 He was received with much enthusiasm and also scored a success in society. His delightful manners and untailing animation chaimed every one. In November he was again in Berlin, and during the winter he completed the 'Reformation Symphony' for the Tercentenary Festival of the Amsburg Confession. He declined the professorship of music in the university, preferring to carry out the program which his father had mapped out for him In May 1830 he visited Weimar, where he again met Goethe, afterward going to Munich, and later to Italy Preparations for his retuin began in June 1831, and after visiting many cities he arrived in Munich where his concerto in G minor was performed for the first time on 17 October

Another visit to London was made in the spring of 1832, during which he composed with unabated vigor. Among the more important productions of this time were his musical representation of Goethe's 'Walpurgs Night,' and the 'Fingal Overture,' which was finished in Rome. Again in Berlin in July 1832, he gave several concerts, producing the Walpuigs Night at one of them. His time was fully occupied in composing, playing and conducting His 'Italian' symphony was completed in March 1833, and sent to London where it was produced on 13 May under his personal direction Later in the month, we find him conducting the Lower Rhine testival in Düsseldorf, where, as a result of his success, he was engaged as director of "all the public and private establishments of the town" for three years with a salary of 600 thalers. He resigned, however, during the second year to accept the position of conductor of the famous Gewandhaus Concerts at Leipzig, then considered the highest position in the musical world of Germany. Thither he proceeded in August 1835, to make arrangements for the season which began on the 4th of October following. Seven concerts were given between that date and 20 November, when he was shocked by the news of his father's death which had occurred the day before. For the first time his radiant disposition forsook him and he fell into a despondent mood. During this season of sadness, however, he was able to finish the oratorio of Saint Paul' while he also maintained the excellence of the concerts for which he was responsible. The great oratorio was first produced at the Lower Rhine Festival at Düsseldorf 22 May

1836. About this time he took charge of the Frankfort Cachen-Verein during the illness of the director, and there made the triendship of Madane Jean-Renaud and her family. He became devotedly attached to her youngest daughter, Cécile, to whom he was married on 28 March 1837. Returning to Leipzig he conducted another successful season, closing with a performance of 'Saint Paul,' for the first time produced in that city. In August 1837, he left his bride for the purpose of conducting 'Saint Paul,' at the Brimingham Festival This was his fifth journey to England, and before he returned he held conferences with his friend, Klingermann, over the plan of a new oratorio having the prophet Edjah as the central figure. He reached Leipzig on 1 October in time to conduct the first concert of the Gewandhaus on the same evening.

The year 1839 was notable for the composition of the 'Ruy Blas' overture for the Leipzig Theatre and the setting of the 114th Psalm to music. In the following year the invention of printing was celebrated in Leipzig by a Testival and the 'Festgesang,' for men's voices, and Lobgesang, of Hynn of Praise, were composed for the occasion During this year Mendelsohn accepted the direction of the musical department of the Berlin National Academy of Aits, but before entering his duties he made another visit to Burningham to conduct a per-formance of the 'Hymn of Praise' On his return he was installed as General-Musik-Director in Berlin, but having the privilege of hying where he pleased, he returned to Leipzig About this time he composed the music for the 'Antigone' and '(Edipus Coloneus' of Sophocles, Racine's 'Athalie' and Shakespeare's 'Tempest' and 'Midsummer Night's Dream'

Another sad trial now befell him in the death of his mother, 12 Dec 1842, and in November of the following year he removed to Beilin. The king of Saxony had recently established a conservatory of music, a plan which Mendelssohn had long cherished, and he and Schumann were appointed professors of composition and the piano. Meanwhile the Gewandhaus concerts were left in charge of Hiller. In 1844 he visited London for the eighth time in response to an invitation to direct several concerts of the London Philhaimonic Society. In October he resigned his position as General-Musik-Director in Berlin and took a much-needed rest until the autumn of 1845 when he again assumed charge of the Gewandhaus orchestra.

Early in 1846 he was back in Leipzig where he took charge of two classes in piano and composition, and among his pupils were Goldschmidt, De Sentis, Tausch and others. The season of 1845-46 was unusually brilliant in concert work and the program showed a great breadth of selection. At the eighth concert he brought with him Jenny Lind, who was then heard for the first time in Leipzig. On 5 Aug. 1846, a preliminary rehearsal of 'Elijah' was held in Leipzig and soon after he started for England on his minth visit, the complete score having been sent over a month earlier for translation. First there was a rehearsal with piano accompaniment at Moscheles' house, followed by two full rehearsals at the Hanover Square Rooms, and later by rehearsals in Birmingham, where on 26 August the oratorio was per-

formed for the first time in public. One of his biographers states that "there was a mad rush at the close of the performance to grasp the hand of the hero of the day, who thanked all piesent for their share in the performance with which he was so deeply gratified. Returning to Leipzig he remodeled the oratorio, however, making so many changes that scarcely a movement stands to-day as it was originally written The complete edition was published in July 1847 The Sacred Harmonic Society of London now invited Mendelssohn to give a production of 'Elijah' in its revised form in Exeter Hall, and for the tenth and last time he visited London in April 1847. Four performances were given, Queen Victoria and the Prince Consoit being present at the second of the series After giving other productions of the 'Elijah' in Manchester and Birmingham, followed by a performance with the Philharmonic Society, he returned to Frankfort, weary and utterly worn out To add to his now unhappy condition, his sister Fanny, whom he had loved devotedly, was stricken with paralysis and died 14 May 1847. On hearing the sad news he fell fainting and for several weeks was utterly prostrated Seeking diversion, he revisited Switzerland during the summer, where, it is said, he applied himself to water-color painting and made excellent progress in that direction Later he resumed composition, numbeing among his productions at that time the beautiful quartet in F minor (Opus 80), and he also wrote some parts of a newly commenced oratorio, 'Christus,' which he left unfinished. He retuined to Leipzig in September, but attempted nothing serious in a musical way. His spirit was broken and he dreaded to appear in public The beginning of the end came on 9 October while calling on Madame Frege, whom he was accompanying in his last set of She left the room to order lights, says one of his biographers, and on her return found him shivering and suffering violent pains in the head. He rallied somewhat, but another relapse occurred on 3 November and he never spoke again. He died the following day and on Sunday, the 7th, was borne to the Paulmen-Kirche, preceded by a band playing one of his Lieder ohne Worte' (Book V, No 3), which Moscheles had scored for the occasion Thence the coffin was taken to the Alte Dreifaltigkeits-Kirchhof in Berlin, where it was deposited in its last resting place.

A cross on the grave bears this inscription: "Jakob Ludwig Felix Mendelssohn-Bartholdy: geboren zu Hamburg, am 3 Feb. 1809; gestorben zu Leipzig am 4 Nov 1847."

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United States National Museum

MENDENHALL, Thomas Corwin, American physicist b near Hanovertown, Ohio, 4 Oct. 1841; d 23 March 1924. He was educated in the public schools and by his own efforts obtained a knowledge of physics and higher mathematics. In 1873 he became professor of physics and mechanics in the Ohio University, where he remained until 1878, when he accepted a call to the chair of physics at the Imperial University in Tokio, Japan. There he founded a laboratory, an observatory, a scientific society, inaugurated a system of lectures, which work was highly approved by the Japanese government. In 1881 he returned to the Ohio University, and in 1884 accepted a position in the Signal Service at Washington. In 1886 he was elected president of the Rose Polytechnic Institute, but resigned in 1889 to become superintendent of the United States Coast and Geodetic Survey, and from 1894-1901 was president of the Worcester Polytechnic Institute. He published several scientific papers and a book entitled 'A Century of Electricity' (1887).

MENDENHALL, Walter Curran, American geologist: b. Marlboro, Stark County, Ohio, 20 Feb. 1871. In 1895 he was graduated at Ohio Normal University; studied at Harvard in 1896-1907 and at Heidelberg, Germany, in 1899-1900. In 1894-96 he was geologic aid, in 1896-1901 assistant geologist and since 1901 geologist on the United States Geological Survey. He had charge of the ground-water investigations of the survey in 1907-10 from 1910 until 1922 served as chief of the Land Classification Board when he became chief geologist. He is the author of various memoirs and articles on professional topics.

MENDES, Catulle, ka-tül mön-das, French writer b Bordeaux, 22 May 1841; d. Paris 8 Feb. 1909 His verse is marked by extreme devotion to form. He also wrote a great deal of prose—short stories, longer works of fiction, dramas. There is much affectation about them

all Among his books are 'Poésies' (1878); 'Monstres Parisiens' (1882); 'La Rose et le Non' (1885), 'Grande Magnet' (1888). Of his plays may be cited 'Le Capitaine Fracasse' (1872) and 'Framette' (1889).

MENDES LEAL DA SILVA, José, hō sa' man' dash la al' da sel'va, Portuguese statesman and poet b Lasbon, 18 Oct 1818, d Cintra, 11 Am 1880. He was Minister of the Navy and of Foreign Atlairs, Ambassador to France, 1874-83, and to Spain, 1883-86. His vogue as a poet has been very great in his own country and his 'Songs' ('Canticos') were first collected in 1858. He wrote also a large number of plays, some of them very popular on the Portuguese stage, as 'Uncle Andrew from Brazil'; and 'The Sportsman'; and also several romances. He became a member of the Portuguese Academy in 1845.

MENDEZ-PINTO, man'dash pen'too, Fernao, or Fernam, Portuguese traveler: b. Montemor-o Velho, near Coimbra, Portugal, about 1510; d. Almada, near Lasbon, Portugal, 8 July 1583. He departed for the Indies in 1537, returning in 1538, and after his death a very curious relation of his voyages, Periginacao de Fernam Mendez-Pinto was published, which has been translated into French, English and other European tongues Congreve, in his "Love for Love," called him "a har of the first magnitude," and from that time his narrative was considered as a romance; but his good faith and veracity are now generally admitted.

MENDIBURU, mān-dē-boo'roo, Manuel de, Peruvian soldier and historian: b. Lima, 1805; d there, 21 Jan. 1885. While a student he joined the patriot forces in 1821, was captured by the Spanish and held prisoner till the close of the war. Among various civil and military posts afterward held by him were those of Minister of War and Finance He published a 'Diccionario Instorico-geografico del Peru,' a work of great value and highly prized by scholars. The first part, in eight volumes, deals with the Inca and colonial periods, and its publication, begun in 1874, was concluded after General Mendiburu's death. The second part was not published.

MENDICANCY, a condition of permanent pauperism, where professional beggars are so numerous that government laws are necessary to remove or control them. A population of mendicants naturally results in a criminal community and all countries containing this element have endeavored to remove this evil by legislation. There were beggars in biblical times As early as 1351 France was compelled to pass laws against "Lazy persons, truants, and able-bodied beggars." Laws were passed in England on this subject as early as the time of Henry VIII. Mendicity has been found to exist to a greater extent in South European countries than elsewhere, and in Spain and Italy the professional beggar has been one of the greatest evils, the standard of prosperity, morality and intelligence declining as mendicity increased.

According to the census statistics of 1900 there were 91,227 professional beggars in Spain, of whom 51,948 were women. In some of the cities beggars are licensed to carry on their trade. Seeking alms is recognized as a legitive

mate business, and the municipality demands a percentage upon the collections. Seville is the only city in the kingdom which tothids begging upon the streets. In some of the other towns beggars are allowed to come out and ply their trade one day in the week, perhaps Friday or Sunday, when the streets swarm with them as they go from house to house, sometimes on hoiseback, and it is said sometimes in carriages also. In Madrid there is no restriction and no license, and the streets are lined with them.

The United States gathers no figures of beggars as their existence is illegal. It paupers, they are supposed to go to the almshouses. The 1910 census showed 73,645 so cated for, 9,500 in New England, 10,272 in New York, 8,653 m Pennsylvania, 7,400 in Ohio, 5,305 in Illinois, 2,927 in Indiana, 2,641 in Wisconsin, 2,600 in

California, etc.

In Mexico, both Indians and native Mexicans to the number of thousands make up the army of professional beggars, and Mexico appears to have no laws to regulate them. In the Mexican cities and at fairs and festivals the mendicants are to be seen in astonishing variety; some manned, some blind and able-bodied fellows with most artistic "make-ups" of tattered garments and unkempt hair and beards. Some of these stand before one silently with a dumb appealing look in their eyes. Others kneel in the nudst of the way and fill the air with their doleful stereotyped appeals for charity. These beggars are humbugs after the manner of their kind the world over.

In the United States, where labor is in greater demand and better paid than abroad, there seems to be no excuse for mendicity, and yet there are many professional beggars here, operating in organized groups. The laws of Massachusetts, New York and some other States make vagrancy a crime and authorize the commitment of tramps to the workhouse, house of correction and common jail for varying periods. In the Atlantic Coast States the evil

is a serious one.

New York City is a beggars' paradise. Between 6,000 and 8,000 professional mendicants make that city their home. Every other city in the United States suffers from the professional beggar, but not to the same extent as New York. The outdoor officer of the Charity Organization Society says that mendicants from all parts of the country flock to New York because the indiscriminate giving there is so common. Cities and States ship their beggar population to New York. About 10 per cent of these beggars are women.

MENDICANT ORDERS. See MONASTI-

MENDIVE, mān-dē'vā, Rafael Maria de, Cuban poet: b. Havana, Cuba. 24 Oct. 1821; d. Matanzas, Cuba, 1886. His first collection of poems (1847), entitled 'Passion-Flowers,' is widely popular. Banished in 1869, he lived alternately in New York and Nassau, writing legends and stories in verse. He was one of the most notable of Spanish-American poets; and many of his verses received English, French and Italian translations.

MENDOCINO. See CAPE MENDOCINO.

MENDOTA, III., city of La Salle County, 80 miles west of Chicago, on the Chicago, Milwaukee, St. Paul and Pacific, the III. Central and

the Chicago, Burlington and Quincy railroads. The city contains the Blackstone School, Lincoln School, a public library, agricultural implement works, machine works, water-tank heater works, etc. The municipality owns the water-supply system and the sewage system. Pop (1930) 4,008; (1940) 4,215.

MENDOTA LAKE. See Four Lakes.

MENDOZA, měn-do'tha, Antonio de, Spanish administrator, b about 1485; d Lima, Peru, 21 July 1552 In 1535 he was appointed by the Emperor Charles V, with whom he was in great personal favor, viceroy of New Spain (Mexico), being the first of 64 viceroys, with the longest administration and that which shows the best record in the history of that provincial government He made many reforms, especially in relieving the oppressed natives; developed agriculture and mining; es-tablished the first Mexican mint; founded the first college; and introduced the first printing press In 1551 he became viceroy of Peru, where he caused to be prepared a code of laws that has been the basis of the colonial and, to a large extent, of the present legal system of the republic. It was under Mendoza's administration in Mexico that Francisco Vasquez de Coronado (q v) undertook his famous exploring expedition.

MENDOZA, Diego Hurtado, dē-ā'go hoorta'do, Spanish author and statesman, great-grandson of the Marques de Santillana (qv): b Granada, 1503; d. Madrid, 15 April 1575. He was educated, as a younger son, for the Church, but, after studying Arabic at Granada and the humanities at Salamanca, entered the army and in 1525 fought at Pavia. He acted as Charles V's Ambassador to England in 1537, to Venuce in 1538, to the Council of Trent in 1545 and to the Papal See in 1547, when he became governor of Siena. With Philip II he quarreled and in 1564 was interned in Granada, only returning to court in 1574, soon before his death. To his stay in Italy was due his influence in making the Spanish lyric thoroughly Italianate; and from Italy he brought an un-usual knowledge of the classics as well as a fine collection of Greek manuscripts. Mendoza also perfected the Spanish poetic epistle. The famous romance, 'Lazarillo de Tormes,' has been ascribed to him. But his greatest work is his history of the Moorish insurrection, 'Guerra de Granada,' a model of historical impartiality and on a theme for which knowledge of Arabic peculiarly fitted him. So impartial was this work that it was not published complete for many years, and even now a good edition is a desideratum. Consult the biography in German by Fesenmair (1882).

MENDOZA, Pedro de, Spanish explorer in America, founder of Buenos Aires: b. Guadix, Granada, about 1487; d. at sea, 1537. He was a favorite of Charles V; fought bravely in Italy; and in April 1535 left Spain with 12 ships and 800 men, sailed up the Plata River and founded the city then called "Nuestra Señora de Buenos Ayres" His further movements were unfortunate; Indians and disease attacked his men, three-fourths of whom, including his own brother, were lost. The natives captured and burned the city and Mendoza, rescued none too soon by his brother, who came with reinforcements, set sail for

home. But his health and reason were undermined and he died on board ship.

MENDOZA, Argentina, a province in the western part, on the eastern slope of the Andes Mountains; area, 56,502 square inites. Mount Aconcagua, 22,427 feet, is on the northwestern boundary. The western part of the province is mountainous, the eastern part pampa land and fertile where watered by the streams or by irrigation, but the climate is hot and dry. There are four important rivers, the Mendoza, Atuel, Diamante and Tunuyan. The Transandean Railway from Valparaiso to Buenos Aries divides the territory. There is also a railway to San Juan and San Carlos, and a southern line from San Rafael east. It is rich in minerals, especially silver and copper. Coal and petroleum abound. Grapes grow luxuriantly and a large quantity of wine is shipped to the other provinces. Cattle, hides and wool are the chief exports. Wheat and corn are increasing in importance. Pop. 496,000.

MENDOZA, Argentina, city, capital of the province of Mendoza, at the base of the Andes, on the eastern side of the mountains, on the railroad which extends from Buenos Antes to Valparaiso, Chile, about 600 miles west by north from Buenos Aires and 165 miles east of Valparaiso. It is about 2,400 feet above the sea. The city was founded in 1559 It belonged to Chile previous to 1776. In 1861 it suffered from an earthquake which killed about 10,000 people and destroyed a great part of the city. The Transandean Railway connects the city via Villa Mercedes with all the large cities of the eastern coast, also with Santa Re and Cornentes. It has churches, banks, department stores and is an important trade centre. It is the seat of two national normal schools, a national college and an agricultural institute. Pop about 82,000.

MENE, me'ne (numbered); TEKEL (weighed); UPHARSIN (divided), the Chaldee words traced on the wall at Belshazzar's feast and significant of his impending doom (Dan. v). The astrologers could not read them, because they were written in antique Hebrew characters, but Damel understood their awful meaning; and the same night witnessed their fulfilment.

MENEDEMUS, founder of the school of philosophy called Eretrian from his native city Eretria: b. about 351; d about 277 BC. Traditions vary as to whether he turned to philosophy under the influence of Plato, or under that of Sulpo of Megara, but his tenets seem to have most resembled those of the Megarian school.

MENELAUS, měn-ē-lā'ŭs, in Greek legendary history, the son or grandson of Atreus and brother of Agamemnon (qv). From his father-in-law, Tyndareus, whose daughter Helen he married, he received the kingdom of Sparta or Lacedæmon Paris, son of Priam, king of Troy, having carried off his wife, Helen, with a part of his treasures and some female slaves, and conveyed them to Troy (qv.), Menelaus, accompanied by Ulysses (qv.), went thither to demand the restitution of his wife and property, and this being refused, he summoned the Greek princes to revenge the affront according to their promise.

After the conquest of Troy, Menclaus took Helen to return with her to his native land leight years he wandered before he reached home. On the island of Phatos (q v) he surprised Proteus asleep and compelled him to disclose the means which he must take to reach home. See Trojan War.

MENELIK II, men'ë-lik, emperor (Negus Negusti King of Kings) of Abyssina: b 1844; d December 1913 The son of a king of Shoa, he seemed the throne in 1889, in which year he signed the Treaty of Uccialli with Italy He He discovered some years later that by the Italian text of the treaty he was bound to conduct his foreign affairs through the Italian government, while the Amharic text made this optional. He accordingly wrote to Queen Victoria in 1893 and protested against the treaty as infringing upon his sovereign rights. In 1896 he fought a war with the Italians and severely deteated them in the battle of Adua His complete independence was then recognized by Italy and the other European powers He concluded treaties of commerce with Great Britain and other countries and co-operated with the British army against the Sudan dervishes A humane and just ruler, he endeavored to apply the arts of civilization to his backward country. He was succeeded by his nephew Lij Yasu, deposed in 1916

MENENDEZ DE AVILES Y MARQUEZ. mā něn'děth da a-ve las' e mar'kěth, Pedro. Spanish captain, founder of the city of Saint Augustine, 14a.; b. Aviles, Austria, 1519; d. Santander, 17 Sept. 157-1. In June 1565 he sailed with 1,500 men in 19 vessels to dislodge the French in Florida, landed there 28 August; and 6 September began a fort, the nucleus of the present town. He attacked the French garnson at Fort Caroline, during the absence of part of the force, which had set out to at-tack him but was storm-stayed and finally wrecked. Menendez slaughtered the remnant at the fort and those saved from shipwreck. He returned to Spain in 1507; visited America twice again, strengthening Saint Augustine in 1568, and in 1570 sending a party of colonists to the Chesapeake and up the Rappahannock where they were massacred by the natives; and was recalled to Spain shortly before his death. During the last two years of his life he was governor of Cuba. Consult Winsor, J., 'Nar-tative and Critical History of America' (New York 1886).

MENENDEZ Y PELAYO, ë pā-la'yō, Marcelmo, Spanish critic: b Santander, 3 Nov. 1856; d. there, 19 May 1912. He was educated at Madrid and Paris; in 1878 became professor of philosophy and letters in Madrid; three years later was elected to the Spanish Academy; and in the late ninetics became director of the Biblioteca Nacional. He lectured often, especially at the Athenaeum in Madrid. For several years he was dean of the faculty of letters at the University of Madrid, he served a term as senator, was connsellor of public instruction and chief of the board of archivists. He received many honors, including the grand cross of the Order of Alfonso XII. His literary style was finished and elegant and he was ever a staunch defender of Catholicism. He wrote 'Estudios criticos sobre Escritores Montañeses' (1876): 'Horacio en España'

(1877); 'Historia de los Heterodoxos Españoles' (1880-81); 'Calderon y su Teatro' (1881); 'Odas, Epistolas y Tragedias' (1883); 'Historia de las Ideas estéticas en España' (1884-91)

MENENDEZ PIDAL, Ramon, Spanish critic, philologist, educationalist and general literary man: b Corunna, 13 March 1869. Educated at the universities of Madrid and Toulouse he became professor of Romanic philology at the former (1899). See Pidal, Ramon Menendez.

MENEPTAH, or MERNEPTAH, king of Egypt about 1250 n.c. He succeeded his father, Rameses II, and reigned for a period of 20 years. His reign was troubled by an invasion from Libya, but he succeeded in crushing it and thereafter set about the construction of numerous buildings and monuments, especially at Tanis. In 1898 his mummy was discovered at Thebes and now reposes in the Cario Mu-Previous to 1890 it was thought that Meneptah was identical with the Pharaoh of the Exodus, but in that year an inscription was uncovered in which it was stated that Israel was settled in Palestine in the fifth year of Meneptah. This inscription is of prime historic interest as fixing the period of the set-tlement of Israel in Palestine and as the only mention of Israel on Egyptian monuments. For the inscription consult 'Der Sieges-hymnus des Meneptah auf der Flinders Petrie rus des Menepian auf der Flinders Pettie Stele' (in Zeitschrift für agyptische Sprache, Vol. XXXIV, Leipzig 1896) Cousult also Breasted, J. H. (History of Egypt' (2d ed, New York 1900) and Budge, E. A. T. W, (History of Egypt' (New York 1902).

MENES, me'nez, according to Egyptian traditions, the first king of Egypt. Herodotus relates that he was the founder of Memphis, which he built on a piece of ground which he had recovered from the Nile by altering the niver's course. According to Diodorus, Menes introduced into Egypt the worship of the gods, as well as a more clegant style of living. He has been identified by some with the Miziaim mentioned in Gen. x, 6. A tomb supposed to be that of Menes was discovered near Nakadeh by De Morgan in 1897. Consult Breasted, J. H. (History of the Ancient Egyptians) (New York 1908). See Egypt

MENG CHIANG. See Mongolia. MENG-TSE, meng-tse. See Mencius.

MENGER, Karl, Austrian political economist: b. Neu-Sandez, Galicia, 1840; d 27 Feb. 1921. He studied at the universities of Vienna and Prague, giving special attention to law and political economy. In 1872 he began his long connection with the University of Vienna, being appointed full professor of political economy in 1879. He was created life member of the Austrian House of Peers in 1900. As an economist he was undisputed leader of the new school of economics in his country and was opposed to the traditional system hitherto followed. He published several important works, including 'Grundsatze der Volkswirtschaftslehre' (1871); 'Untersuchungen uber die Methode der Sozialwissenschaften und der politischen Oekonomie insbesondere' (1883); 'Die Irrtimer des Historismus in der deutschen Nationalokonomie' (1884); 'Bei-

trage zur Wahrungsfrage in Oesterreich-Ungain' (1892) and the article "Geld" (in 'Handworterbuch der Staatswissenschaften,' 3d ed., 1909)

MENGS, Anton Raphael, German painter: Aussig, Bohemia, 12 March 1728; d Rome, 29 June 1779 In early childhood his father, Ismail Mengs, a miniature painter of little talent, who was settled at Dresden, took him in hand to make a painter of him, and in 1741 carried him to Rome and set him to study the antique and to copy Michaelangelo and Raphael. He was compelled to do a certain task in painting every day, his day's work subjected to severe criticism; and he was even punished if it was not satisfactory From this constant practice he early garned skill as an artist, and when he returned to Dresden his talent and proficiency were at once recognized by August III, who appointed him court painter and gave him permission to return to Rome At Rome he attended the Academy and in 1748 produced a large and elaborate composition, 'The Holy Family,' taking as model for the Mother of Jesus a beautiful peasant girl, whom he afterward married On his return to Dresden he was commissioned to paint an altar-piece, 'The Ascension of Christ,' for the high altar of the Chapel Royal, and was given permission to retuin to Rome for the purpose of doing so. A new academy of painting having been opened in the capitol he was appointed director and painted for the Celestines the ceiling of their church, San Eusebio, for Cardinal Albani the (Painassus) in the ceiling of his villa, and several oil paintings, including (Cleopatra,) (The Holy Family) and (The Magdalen) for private persons When King Charles III of Spain summoned him to Madrid he executed for him in fresco there (The Assembly of the Gods) and (The December of the Cross); he also and 'The Descent from the Cross'; he also completed the altar-piece for Dresden. He returned to Italy in 1769, stayed eight months at Florence and painted for the Pope a ceiling fiesco for the Vatican Library In 1772 he went to Spain and produced for the king the fresco 'Apotheosis of Trajan,' his finest work, but returned to Rome in 1775. On his death the Cavalier d'Azara set up a statue to him and Catherine II of Russia raised a splendid tomb for him in Saint Peter's. He was certainly one of the most important painters of his day, and if he possessed none of the free and living originality of genius he was a master of noble composition and design. He was catholic in taste and eclectic in style, drawing inspiration from the antique, as well as imitating Raphael, Titian and Correggio, whose styles he tried to blend. Consult Woermann, (Ismail und Consult Raphael Mengs' (in the Zestschrift für bildende Kunst, No. 5, 1893).

MENHADEN, a species of fish (Brevoortia tyrannus) of the herring family (Clupeidæ), appearing in vast schools along the Atlantic Coast of America Owing to the large number of local names applied to this species much concusts in the minds of fishermen and others. The name "menhaden" (Indian) is used chiefly in southern New England. North of Cape Cod the fish is called pogy, or occasionally hardhead; in New York and New Jersey, bunker or marshbunker; the fishermen of Delaware

and Chesapeake bays know it as bay alewife, and in the latter region and southward also as bug-fish or bug-head; still farther south it becomes the fat-back, and so on From the other herrings the menhaden is readily distinguished by its very large head, large mouth, complex gill strainers and crenulated scales. The body gill strainers and cienulated scales is deep, the fins small, the mouth toothless and the color bluish and silvery, with one large and several small black spots

Like some other pelagic and migratory fishes the menhaden is exceedingly irregular in its movements and variable in abundance and distribution from year to year, but its general range is from Nova Scotia to Brazil and oceanward, so far as observed, to the Guli Stream. In spring it approaches the coasts and extends northward with the alewives and other species, probably for the purpose of spawning in brackish water, though little is actually known of its spawning habits. In winter Cape Hatteras marks the northern limit of its abundance. The menhaden swims in compact schools of large size, the movements of which at the surface, or sunken to a greater depth,

are extremely irregular.

These irregularities are owing, no doubt, to corresponding variation in its food-supply, which consists wholly of the minute organisms, both vegetable and animal (plankton), that are caught as the fish swims with open mouth, straining the water through its lips and gillarches as it goes. Owing to its strong oily taste and extreme bonyness its value as human food is very slight, but as furnishing food for other fishes, as bait, and for the manufacture of oil, fertilizer and other products, it has a very great economic importance. Large companies control its capture for the latter purposes and, besides pound nets, utilize many steamers provided with purse seines and derricks, by means of which entire schools are taken at a haul and lifted on deck. The oil is extracted and the solid parts ground up for fertilizer at factories on shores. The product varies from year to year, but the total weight of fish taken runs into the hundreds of million pounds. The catch of fish and industries involved reached their highest level of importance in the latter part of the last century, since which both have much diminished, whether by reason of over-fishing or because the menhaden no longer come to the northern part of the coast in so great ahundance, is not determined. Consult Goode, 'History of the Menhaden,' Report United States Fish Commission, 1879, and recent reports of the United States Bureau of Fisheries

MENHIRS, elongated, rough-hewn monoliths standing with one end in the ground. They are found of various sizes, from about 6 to as much as 67 feet high, the latter being the height of that at Locmariaquer in Brittany. Singular superstitions naturally attach to some of them. See Stones, Standing.

MENIERE'S DISEASE, a disease of the ear first described by the French physician, Emile Antoine Mémère, in 1861. It is one form of auditory vertigo and usually attacks persons of middle age. The principal causes are sunstroke, influenza, rheumatism, anæmia and venercal diseases. The attack is usually very sudden and appears to be due to hæmorthage into the labyrinth The seizures may occur at irregular intervals of days or even weeks. While the symptoms of dizziness, vertigo, nausea, etc., gradually disappear the deafness is generally permanent. Potassium iodide is most serviceable in reducing the dizziness. See EAR

MENIN, Belgium, town in the province of West Flanders, on the Lys and on the Belgo-French frontier here demarcated by the river, seven rules southwest of Courtrai, and 30 miles southwest of Ghent It contains lace and cotton mills, tobacco factories, etc. In the neighborhood there were extensive tohacco plantations previous to the war of 1914-18, in which Menin suffered severely. It fell to the Germans during the great rush of both armies northward to the sea; was taken by the British in a spuited attack, but was subsequently evacuated by them for strategic reasons. The British havmy noted a German concentration of troops and materiel in Menin made an acual attack upon it which brought damage to a great number of buildings. Pop 18,600

MENINGITIS. The brain is enveloped by three membranes called the meninges. Next to the skull comes the dura mater, then the arachnoid and innermost is the pia mater. These three membranes are prolonged from the brain in three envelopes of the spinal cord Meningitis is an inflammation of the meninges of the brain or of the spinal cord. It is very rately a primary condition, but is usually secondary to infection from micro-organisms of many types, or results from chronic poisonings such as lead, alcohol, etc. Hence modern medi-cine speaks of various meningitides rather than one meningitis. When the surface of the brain is wounded by some object breaking through the skull, or a piece of broken bone of the skull, thrust inward by some blow, an artery is suptured and the blood flows between the membranes. Such a condition is called traumatic meningeal hamorrhage. When the dura mater becomes inflamed after a wound, or after inflammation of other parts of the head, as the ears, teeth, etc., there, results a condition called pachymeningitis externa Inflammation of the meninges, however, is generally confined to the pia mater and the arachnoid and is then called leptomeningitis, Pachymeningitis, inflammation alone or chiefly of the dura mater, may extend to the other membranes. Inflammation of the cerebial meninges is cerebral meningitis; of the spinal meninges, spinal meningitis; of those of the brain and spinal cord together, cerebro-spinal meningitis. Ascending meningitis is a meningitis ascending from the lower part of the spinal cord.

Pachymeningitis has one form involving the external surface of the dura mater and resulting from blows or other injuries, and from osseous growths. There may be no well-defined symptoms, but usually is local headache and tenderness on pressure. The onset is usually sudden. Many cases of meningitis of the type called "serous" are not other than pachymeningitis. If the dura mater, which is normally free, is bound to the skull by fibrous exudation, and especially if pus forms and hæmorrhages occur, there are symptoms of pressure. Inflammation of the internal portion

of the dura mater may result from the extension of inflammation from adjacent parts, such as the ear, the frontal or the ethnicial sinus; or it may attend cases of perincious anaema, chronic syphilis, tuberculosis and chronic micetious diseases. It occurs chiefly mold age, but has been seen in children. There are fibrinous deposits and extravasation of blood in cysts (hematoma), and occasionally pus forms. The brain is ancenic, sometimes softened. The symptoms are those of irritation—convulsions, vointing, dilated pupils which are not affected by exposure to light, a slow irregular pulse, etc—and those of compression or pressure—coma, etc. Pachymeningitis is usually fatal.

Cerebial meningitis (simple or cerebral

meningitis), in the acute form, is not common. and is most apt to occur in men engaged in hard mental pursuits. It may be caused by injuries, by sunstroke, by spuritions liquors, etc., and is very dangerous, death usually occurring in from three to eight days. The brain is reddened and covered more or less with pus and coagulated fibrin or lymph, and its superficial layer is softmonth of the control of the brain-cavities. The symptoms are those of three stages. (1) Headache; (2) delinium; (3) coma At first there may be slight fever, some photophobia, frequency and mregularity of the pulse and some contraction of the There is a disposition to vomit, a slowness in movements of the bowels and often hyperasthesia. Then comes delium, which myperæstnesia. Then comes defittim, which may or may not be active; the patient talks much and tries to get out of bed, does not obey readily. There is more or less trembling of the limbs, with difficulty in moving them. One pupil is likely to be dilated. Sometimes strabismus occurs; the pulse is very irregular; and paralysis begins. Then follows come, loss of some sensetion and of voluntary medical of sense, sensation and of voluntary motion; there is sighing, the pulse is frequent and weak, the pupils do not respond readily to light and the capillaries of the skin and eye are congested. Recovery from this disease rarely occurs after the period of coma begins.

Sub-acute or chronic cerebral meningitis is a secondary disease, sometimes associated with chronic syphilis, Bright's disease, alcoholism, etc., though the cause is not always ascertained. The lesions are similar to those of acute meningitis, but less pronounced. There is less of serum and pus, and the exudated fibrin is more circumscribed. The symptoms are insidious and vague. Headache, vomiting and photophobia are rare. The slight delirium is followed, it may be, by somnolency, irregular pulse, strabismus and sighing respiration. With coma the pulse is rapid, 120 or more, and the patient

dies as in acute meningitis.

Tuberculous meningitis, also known as acute hydrocephalous, granular meningitis and basilar meningitis, is an acute tuberculous inflammation of the pia mater, caused by a deposit of miliary granules over the surface of the brain, but most numerous at the base, in the track of the cerebral vessels, and in their sheaths. There is a noticeable vascularity, especially in the ventricles. The pia mater is thickened and opaque and covered with a semi-purulent exudation. Serum fills the ventricles and formina, pressing upon the convolutions, and assists in softening portions of the brain. The lesions in this disease are rarely limited

to the brain; tubercles are found in other organs, especially the lungs. The disease is a phase of that protean malady, tuberculosis, though the cerebral lesions may first be noticed. The primary causes are a hereditary diathesis (scrofulous or tuberculous), foci of caseous degeneration in some organ, a supputating joint, or a scrofulous inflammation of bone The physically weak children of tuberculous parents are most subject to this disease, and in cases where strong children are attacked there is generally found a tubercular relative. Though the disease is essentially a disease of early life (from nine months to 10 years), it also attacks adults. Most of those affected die in from two to six weeks. The symptoms may be classed under three heads: (1) Obscure symptoms; (2) those of rapid development; (3) those of coma. There are seen listlessness, loss of appetite, occasional vomiting, slowness of the bowels and somewhat frequent pulse. Sometimes there is headache, a remittent form of Icver and then 1apid development of diagnostic symptoms. The patient talks a good deal. One of the most important symptoms is a change in the disposition through which the child, although bright and lively before, suddenly becomes listless, or excessively emotional, a condition which may continue for several weeks. There are irregularity of the several weeks There are irregularity of the pupils and pulse, a sharp "cephalic" cry, severe headache, insensibility to light and sound, grinding of teeth, a flushed face in paroxysms, usually before convulsions, rolling and drawing back of head, urine scanty and high-colored, oscillation of the eyes, obstinate constipation, etc. With coma comes strabismus; the pupils do not contract under the influence of light, but will contract and expand when the bowels numble or the patient is moved. There are convulsions, paralysis and automatic movements of the feet and hands, it may be for hours. The thumb may be turned in. There is a hollowed abdomen (boat-shaped) and congestion of the eyes, a puri form secretion sticking the eyclids together; involuntary dis-charge of bowels and bladder, are common. For treatment of this affection place patient in bed, in a quiet room; give easily digested food; apply an icc-cap to the head and warmth to the feet. Further treatment should be in the hands of a physician. Much can be done by parents and guardians to prevent the onset, by not developing the nervous system at the expense of the muscular and digestive systems. Precocious children are to be judiciously restrained, and outdoor life encouraged. Tuberculous meningitis in adults is commoner in men than in women, and most frequently occurs between 17 and 30. It is generally fatal in 2 to 14 days, about one in 200 cases recovering.

Spinal meningitis is not common; it is usually caused by infection, is liable to occur in children with spina bifida and is rarely amenable to treatment Death occurs usually in from eight to 10 days, either from extension of inflammation to the brain and pressure there by fluid, or from asphxyia due to spasms of the respiratory muscles. The lesions are similar to those of cerebral meningitis. The chief symptoms are pain in the spine and extremities, increased by movements

of the body, great sensibility of the surface of the body, spasms of muscles, opisthotonos and

dyspnœa.

Epidemic cerebro-spinal meningitis, or spotted fever, is due to a special micro-organism, the diplococcus intra-cellularis Death frequently occurs in a few homs; recovery usually requires 30 or more days. The disease has spread over sections of this country two or three times, mainly in the winter and spring. The exact manner of its transmission is not known One form is characterized by lever with no eruption; the other by lever and an eruption The symptoms are a chill or chilliness, followed by nausea and vomiting, fever, violent headache, sometimes with pain down the spinal column, general hyperæsthesia, great prostration, vertigo, tetanic rigidity of muscles, irritability or apathy, delirium and other symptoms of meningeal irritation, followed more or less rapidly by those of coma. In the majority of patients if the head is raised when the patient is lying on his back, the knees are involuntarily flexed. When there is an eruption it usually appears early and consists of dark blotches, from the size of a pinhead to that of a nickel, and is not marked on the extremities.

Where death occurs within 12 hours from the time of attack only a congestion of bloodvessels of the brain and, it may be, of the spinal cord, is generally found. Almost always there is lymph or pus beneath the pia mater, and sometimes serous effusion in the plema, pericardium or peritoneum. The blood undergoes a change, ecchymoses are found sometimes in the muscles, or in connection with the pericardium or pleura. This disease is treated with a serum, which was first produced in the monkey but now is successfully derived from the horse. The serum is given in frequent doses depending on the severity of the case, from 12 to 24 hours apart; this treatment has reduced the mortality to 30 per cent. In the chronic variety serum therapy is of no avail; the application of cold to the head should depend upon the desires of the patient l'ain has to be controlled by morphine Sulfanilamide and related compounds have helped many of the patients with infectious meningitis.

SMITH ELY JELLIFFE, M.1).

MENIPPUS, më-nip'üs, Greek cynic philosopher, a native of Gadara in Palestine, and supposed to have flourished about 260 be I IIs writings were chiefly of a satirical kind Lucian styles him "the most snarling of cynics," and in two or three of his dialogues introduces him as the vehicle of his own sarcasms. It appears that his satires were composed in verse and prose, on which account those of Varro were denominated Menippean, and for the same reason the name of Satire Ménippée was given in France to the celebrated piece written against the League and Philip II of Spain, its head His writings are lost

MENKEN, Adah Isaacs (originally Do-LORES ADIOS FUERTES), American actress: b. near New Orleans, La, 15 June 1835; d. Paris, France, 10 Aug 1868 Making her début with her sister as danseuses, at the New Orleans French Opera House, she was received with marked favor and visited Cuba, Texas and Mexico. On her return to New Orleans, she published a volume of verse and taught French and Latin at a girls' academy in that city. In 1858 she appeared in 'Fazio' in New Orleans, and went to England in 1863-64, assuming the rôle of Mazeppa at Astley's which won her popularity. After 30 Dec. 1866 she played in Paris for 100 mghts, and later in Vienna and London. Her last appearance was in Paris in May 1868. She was famous for her fine form, and many marriages and divorces; Alexander I. Menken, John C. Heenan, J. H. Newell and James Barcley being her successive husbands. Her mind seems to have been as winning as her physical beauty, for among her friends were numbered Charles Reade, Dickens, Swinburne and the elder Dumas.

MENNO SIMONS, Dutch religious re-former b Witmarsum, Friesland, 1492; d Oldesloe, Holstein, 19 Jan 1559 He was ordained priest in the Roman Catholic Church and took pastoral work in the village of Pingium (1521), and from a study of the New Testament, undertaken (1530) to solve his doubts about transubstantiation, he was induced to become an evangelical preacher and finally left the church of his ordination. The martyrdom of Sicke Snyder at Leeuwarden for Anabaptism impelled him to consider the Scriptural grounds for infant baptism. He was finally converted to the cause of the Anabaptists, but never sympathized with the excesses of Munzer and wrote a diatribe against John of Leyden (1535) In 1537 at the request of a number of Anabaptists of Gioningen he assumed the functions of an Anabaptist preacher and exercised, by his moderation, a most salutary influence on his fellow ministers. He now married, his change in faith having superseded his vow of celibacy, and began to travel as an evangelist not only in Friesland but throughout Holland and Germany as far as to Livonia Being persecuted from place to place he finally settled in Oldesloe in Holstein, where he closed his ministry with the consciousness of having founded a large and flourishing sect, whose subsequent history is related under the title Mennonites (qv)

Views of Menno Simons.—Menno was rather a preacher of a system of personal sanctity than either a dogmatist or a violent fanatic like some of the Anabaptists. He was a man of pure moral and devotional enthusiasm, whose account of his own conversion reads like a passage from the (Confessions) of Augustine. He sums up the results of his labors as consisting in the conversion and recovery of the wicked. Yet he formulated a somewhat vague profession of faith. He believed in the divinity of Christ, who was born on earth in Mary, that is without taking upon him human flesh and blood. He rejected infant baptism, and baptized those only who made a personal profession of faith in Christ. He particularly emphasized the power of excommunication possessed by the Church, without which "the spiritual Kingdom of God on earth cannot," he said, "exist in purity and piety." He believed in the coming millennium (q.v); he excluded civil magistrates from church membership on the ground that the church was a theogracy whose magistrates were the ministers. He declared that war and all taking and administering of oaths were unlawful, and regarded human science as useless, even pernicious to a Christian. These decrees, however, as modified by the explanations of Menno, differed little from those generally promulgated by the Reformed bodies of his day. His principal teaching was of a moral and practical character. He was a meek, humble, noble-minded man, carried away with the spirit of his times, encouraging all that was good and pure among his followers, and sternly rebuking the guilty. The best edition of his work is 'Opera Omnia Theologica of all de Godigeleerde werken vann Menno Simonis' (1681). Consult Harder, 'Leben Menno Simons' (1810); Roosen, 'Menno Simons den evangeleschen Mennonitengemeinden geschildert' (1818).

MENNONITES, a body consisting of a dozen or more branches of followers of Menno Simons, akin to Baptists in faith and practice: Menno Simons (1492 1559), a Holland Ana-baptist, was not the founder of the body that bears his name, but was a convert to it several years after it began, and became its chief leader and author. He early left the priest-hood of the Roman Catholic Church, espousing the views of the Anabaptists, but opposing the fanatical extremists of Munster. His books were his chief contribution to the movement, which really grew out of the division of Protestantism which is called by the name Anabaptist. The Anabaptists were opposed to the baptism of infants, baptizing only on confession of faith. The followers of Menno Simons became numerous in Holland, Germany and Switzerland, and thousands were persecuted to death, particularly in Holland, because of their views in regard to the temporal power. Rising in the first half of the 16th century (they were first called Mennoutes in 1550, though the name was never generally adopted in Europe as it was in America) they increased under persecution and emigrated to Russia and the United States to escape it—to the former country near the close of the 18th century and to the latter from 1040 on, coming from Holland, and Germany to New York and New Jersey. They were drawn to Pennsylvania by William Penn's announcement that those settling in that colony would enjoy freedom in the practice of their religious faith. The Society of Friends in England assisted the Men-The first nonites of Holland to emigrate. Mennonite colony was formed at Germantown, near Philadelphia, in 1683 Thence they spread to Lancaster, Bucks, Berks and other counties in Pennsylvania and from that State to other States and to the Canadian provinces. They States and to the Canadian provinces. They came in constant contact, in colonial and post-colonial days, with the Indians, but like the Friends, being opposed to bearing arms and inclined to peace they suffered little from attacks by the savages. It is worthy of note that a Memonite meeting at Germantown as early as 1688 adopted a protest against the traffic in slaves, saying that those "who steal or rob men and those who buy or purchase them" are all alıke

Though Mennonites are widely divided among themselves on questions of practice and principle, they are in substantial agreement in holding doctrines of the evangelical type, as expressed in a declaration of faith adopted at Dort, Holland, in 1632, which confes-

sion is generally accepted by the Mennonites of America. They adhere to the principles of autonomy of the churches, freedom of conscience, separation of church and state, adult haptism, non-resistance and practical picty. Baptism is administered on confession of faith, not by immersion, but by pouring, the candidate either kneeling or standing in water and the minister taking up water in both hands and pouring it upon the head, using the scriptural formula In the ministry there are bishops, or elders, ministers, who are pastors or evangelists, and deacons, who are almoners and assist in administering the ordinances and take charge of congregations in the absence of bishop or munister Ministers are selected by members of the church, who go one by one to a private room for the purpose If more than one are thus selected choice between them is made by A bishop has charge of all the churches in his particular district and ordains the ministers and deacons. He is selected in like man-ner as ministers and deacons. The Lord's ner as ministers and deacons Supper is observed twice a year, in the spring and in the fall, preceded by an examination of each member in faith and standing, and fol-lowed by the ceremony of feet-washing and the kiss of peace, the sexes separating for this purpose.

Mennonites are opposed to the judicial oath and many practise non-conformity to the world Their polity provides for the autonomy of the churches, but appeals are taken to the conference Decisions of conference are submitted to the churches for approval.

The 12 or more branches in America differ so little in some instances that it is difficult to distinguish between them except by name. The census of 1916 reported three bodies in the group not in existence, or not known, in 1906. The distinctive bodies are: (1) Mennomite Church; (2) Conservative Amish; (3) Old Order Amish; (4) Church of God in Christ; (5) Old Order Mennomite (Wisler); (6) Reformed Mennomite; (7) General Conference of Mennomites, (8) Defenceless Mennomites; (9) Mennomite Brethren in Christ; (10) Mennomite Brethren Church; (11) Krimmer Brueder Gemeinde; (12) Hutterian Brethren There are besides small unattached bodies which may be grouped as miscellaneous, including the Kleine Gemeinde, Stauffer Mennomites, etc.

A historical distinction, which also marks a difference in doctrinal position, may be traced between two European groups and through their descendants in America: (1) Those of Holland, Switzerland and northwestern Germany, and (2) those of Prussia, North Germany and Russia. These emigrated from Holland and used the Dutch tongue until after the middle of the 18th century, when they adopted the German which they still employ. They are of the orthodox type The first group became liberal or rationalistic and are not in fellowship with the representatives of the second group

1. Mennonite Church.— This is the largest and oldest body of this faith in America. It is descended from the colony which settled in Germantown. In tendency it occupies middle ground between the stricter and the more liberal schools. Since 1896 it has had a bisennial General Conference, composed of delegations.

gates elected by the State conferences. The Amish body is represented in this conference the two churches are practically one—and cooperates in the conduct of the general missionary, educational and benevolent work. board of missions has missionaries in India and in America, with a department of city missions The chief educational institution is at Goshen, Ind. In 1936 the total membership in Memonite Church organizations (17 in number), was 116,-655. This number included about 1,600 members under the age of 13 years. The number of ministers in all of the bodies was 1,752, who served 1,001 churches. The membership is largest in Pennsylvania and Ohio with representation in other mid-western States and in the South The Memonite, of Berne, Ind, is published in the English language and another paper printed in German is published at the same place.

2. Conservative Amish Mennonite Church.—This is a small body of the Amish type which has churches in Pennsylvania, Illinois, Ohio and Canada The membership in 1936 totaled 2,281 served by 38 ministers in 18 congregations. The churches were combined in a single conference. The Amish settlement in Canada was founded in 1824 in Wilmot Township, Ontario, on land given by Christian Nafziger of Munich. The Amish Mennonites date from 1690, separating from the Mennonites in Switzerland and Alsace on account of their laxness of discipline The name is derived from Jacob Ammon or Amen, who insisted that the doctrines set forth in the Dort Confession of Faith should be interpreted literally and accepted strictly. In late years this strictness has been relaxed and the main body of Amish is practically reunited with the Old Mennonites in the Mennonite Church

3. Old Order Amish Mennonite Church. —This body represents the stricter descendants of Jacob Amen and the Swiss Amish of the 18th century. While the main body of Amish were approaching agreement with the main body of Mennonites, the stricter wing were holding the older position resulting in the organization in 1865 of the Old Order Church This body is opposed to building churches, holding that one place is as sacred as any other and that separate church buildings savor of ritualism. They therefore hold their meetings in private houses, which necessarily makes their congregations small. A Sunday service usually continues about four hours, and is exclusively in German. They use the old hymnal, Aus bund, first published for the Swiss brethren in 1571 and reprinted many times in America. The tunes supposed to be the original have never been committed to musical notation and of course never printed. The sermon is without text, and traces God's dealing with the race from Adam down, setting forth the sinfulness of sin and God's love and care for his obedient children. On communion Sundays services are continued from morning till night without intermission, several ministers being in attendance to keep them going There is no church property, except hymnbooks, plain benches and utensils necessary to the preparation of a plain dinner. Houses and clothing of families, who observe a sort of community life, are very plain, carpets, curtains and wall pictures being forbidden. They have a few Sunday schools and no missionary or benevolent societies, schools or periodicals. They use the ban in discipline, following the example of the original Annsh, who in some cases use the extreme penalty of separation of husband and wife. The person against whom the ban was pronounced was cut off from social and family intercourse with all members of the church and was treated as an outcast. The census of 1936 credits the Old Order Annsh Church with 8,600 members, an increase of nearly 3,000 in 10 years, 127 churches and 355 ministers.

4. Church of God in Christ.—A small body of reformers, led by John Holdeman who insisted that the Menionite Church had forsaken its original foundations. It originated in Ohio in 1859. Holdeman revived the ban as formerly observed in Europe. The body had subsequently considerable accessions of Russian Menionites, under whose influence the stricter views were gradually relaxed. The census of 1930 credits this body with 50 ministers, 26 churches, and 2,100 members. There has been little change in the first two items since 1906, but the number of members was doubled.

5. Old Order Mennonite Church (Wisler).

—Jacob Wisler led a movement in opposition to innovations, such as revival meetings, Sunday schools, etc., which resulted in the organization, in 1870, of the Old Order Church. Other small bodies in Canada, Virginia and elsewhere, which occupied a similar position, joined with the Wisler movement, which holds strictly to the Dort Confession of Faith. The Church has 37 ministers, 23 churches and 1,848 members (census of 1936), each item indicating little change since 1976.

little change since 1900.

6. Reformed Mennonite Church.—This branch is also the result of a reform movement toward stricter regard for doctrine and discipline, led by Francis Herr and his son John. The Herrites have no fellowship whatever with other churches, and conduct no Sunday schools or missions. They are decreasing in number. In 1936 they had 25 ministers, 23 churches and 1,040 members, mostly in Pennsyl-

vania.

7. General Conference of Mennonites in North America.—An attempt to unite various Mennonite bodies holding practically the same doctrinal views and observing the same practices, resulted in a general conference in Iowa, in 1860, and the organization of this body. Groups of Russian and German churches subsequently joined with it. It is active in missionary and educational work. There are boards of home missions, of foreign missions, of publication, of education and of emergency relief. Three colleges are maintained at Newton, Kan., Bluffton, Ohio, and Freeman, S. D. Several periodicals, including The Mennonite, weekly, are published at Berne, Ind. The General Conference accepts the Dort Confession, but does not observe the foot-washing ceremony in connection with the Lord's Supper, nor does it require the women to have a head covering during prayers and worship. Its platform of union is acceptance of the Dort Confession, salvation by grace through faith in Christ, baptism on confession of faith, refusal to take oaths, peace, non-resistance and practice of scriptural discipline. The General Conference, which is gaining in numbers, has, according to the census of 1936, 238 ministers, 138 churches and 25,780 members.

8. Mennonite Brethren in Christ.-This branch grew out of an evangelistic effort in Pennsylvania, in 1853 The first conference Pennsylvama, m 1853 was formed in 1858 The movement spread and three groups came into existence, which united in 1879, subsequently other groups joined the body which took its present form and name There is a general conference which ın 1883 meets every tour years, and five district conferences in the United States and two in Canada, A weekly newspaper, The Gospel Banner, 18 published in New Carliste, Ohio. The General Conference has 125 ministers, 125 churches and 9,000 members

9. Defenceless Mennonite Church.—A small body of 1,500 members, which insists upon a definite experience of conversion, organized under the leadership of Henry Egh, in 1860, an offshoot of the Annsh branch It has a mission in Africa and is akin to the conference of Defenceless Memonites known, until recently, as the Minnesota and Nebraska Conference of Memonites and now affiliating with the Mennonite Church

(See 1 Mennonite Church, supra)

10. Mennonite Brethren Church.—This body, which was not reported by the census of 1906, has three district conferences in the United States and one in Canada It conducts home and foreign missions and has a college at Hillsboro, Kans, where it publishes the Zion's Bota. The census of 1930 gives this church 201 ministers, 62 churches and 8,200 members

11. Krimmer Brueder Gemeinde.—A union of two bodies of Brueder Gemeinde, which came originally from Russia, where they separated from the main body of Mennonites, because they were thought to be lax in religious lite and discipline. They differ from other Mennonites in haptizing by immersion and not by pouring, and they formerly differed among themselves as to the mode, one group baptizing with a forward, the other with a backward movement. There are 1,852 members, with 32 ministers and 10 churches

12. Hutterian Brethren.—These are descendants of the Hutter Brethren of South Russia Their leader was Jacob Hutter, who was burned at the stake at Innsbruck, in the Tyrol, in 1536. The Hutterian Brethren are not strictly Mennomites, but agree with them and are so classed They formerly observed community life in South Dakota, and have sometimes been called Bruederhoef Mennonites. They have (census of 1936)

926 members, with 31 ministers and 12 churches.

The Kleine Geneinde, the Stauffer Mennonites and the Central Conference are small groups, differing in minor particulars among themselves and from other Mennonite bodies. The Central Conference in 1936 had a membership of 4,500 in 25 churches served by 32 ministers Membership in all of the Mennonite bodies

is highest in Pennsylvania.
Consult Smith, C. H., The Story of the Mennonites (Berne, Ind. 1940); Klein, H. M. J., History and Customs of the Anish (York, Pa. 1946); Wenger, J. C., Glimpses of Memonite History (Scottdale, Pa., 2d. ed., 1947), Mennonite Yearbook and Directory, published annovally (Scottdale, Pa.). nually (Scottdale, Pa.). HENRY K. CARROLL, Author of "Religious Forces in the United States."

MENOCAL, Aniceto Garcia, American civil engineer: b. Cuba, Sept. 1, 1836; d. New York

City, July 20, 1908 He was educated in Havana and was graduated from the Rensselaer Polytechnic Institute in 1862 In 1863-1869 he was engaged as sub-chief engineer of the Havana waterworks and in 1870 returned to New York, where he was two years in the engineering branch of the waterworks department. He was chief engineer of all the surveys made for the Isthmian Canal by the United States government and was sent to Paris in 1879 as member of the Canal Congress He was a member of several scientific societies and published many of his official reports

MENOMINEE, the French Folles Avoines, a tribe of North American Indians of Algonquian stock, formerly known in upper Michigan and Wisconsin, along the Menominee River and Green Bay, and ranging west to the Mississippi and south to the Fox River Their name signifying "wild-rice men," hence the French translation is derived from their use as a staple food of the abundant wild rice of the region. Their descendants numbering about 1,890, civilized and Roman Catholics, inhabit Keshena Reservation, Wisconsin.

MENOMINEE, mē-nom'i-nē, Mich, city, Menominee County seat, altitude 595 feet, at the mouth of Menominee River, on Green Bay, an arm of Lake Michigan, on the Chicago, Milwaukee, St. Paul and Pacific, and the Chicago and North Western railroads; opposite Marinette, Wis, and 100 miles in direct line south of Marquette, 46 miles northeast of the city of Green Bay, Wis. It has car-ferry service to Frankfort, across the bay and lake, steamboat connections with lake ports, but it is not a port of entry. It has a county airport Situated in an extensive lumbering region, Menominee is one of the largest lumber shipping ports on the Great Lakes. Its leading industries are those having some connection with lumbering, as the manufacture of furniture. Machinery, electrical goods, limestone products, beet sugar, and paper follow The industrial payroll in the city's industries runs to about \$5,000,000 annually. The city has a public library and a hospital. Projects of the 1930's included an interstate bridge, a yacht basin and breakwater, and a stadium A CCC camp was established in the county Settled in 1799, Menominee received its city charter in 1883 It has a mayor and council. Pop. (1930) 10,320, (1940) 10,230.

MENOMONIE, Wis., city, Dunn County seat, altitude 807 feet, on the Red Cedar River, the Chicago, Milwaukee, St Paul and Pacific, and the Chicago and North Western railroads, and on state and federal highways; 26 miles by rail west of Eau Claire Formerly it was an important lumbering center, and now processes dairy products, flour, and feed. Its principal industrial output is aluminum kitchen utensils There are brickyards The public library is the Mabel Tainter Memorial. The city is the seat of Stout Institute, a state teachers' college since 1911. Settled in the 1840's, Menomonie received its city shorter in 1892. charter in 1882 It has a mayor, two councilmen, and a city manager. Pop. (1940) 6,582.

MENOPAUSE, the cessation of menstrual flow in women; climacteric. This epoch is reached generally between the 45th and 52d years, and is frequently marked by nervous disturbances. The power of child-bearing terminates at the menopause. It is popularly termed the "change of life" A woman who begins child-bearing early and gives birth to a large lamily usually has her menopause earlier than a childless woman. The approach of the menopause is marked by irregular—usually delayed—menstruation, and sometimes the latter flows are very profuse and weakening. See Climacieric.

MENOPOME, a giant salamander of the genus Cryptobranchus (tormerly Menopoma). See Hellender.

MENOTTI, mā-nôt'tē, Gian-Carlo jan-kar'lō, Italian composer and diamatist b Cadegliano, near Milan, July 7, 1911. At the age of eleven, he had written his first opera, *The Death* of Pierrot, and, along with the other nine children, participated in the tamily chamber music group. He attended the Milan Conservatory for two years and in 1928 came to the United States to study at Curtis Institute under Rosauo Scalero In 1933 he began work on the libretto and music for Amelia Goes to the Ball which was successfully produced at the Philadelphia Academy of Music in 1937 and at the Metropolitan Opera House the following year. The National Broadcasting Company commissioned him to write an opera for radio, The Old Maid and the That which were the Cold Maid and the Thief, which was presented in 1939. Among his other works are The Island God, another opera produced at the Metropolitan, The Telephone (qv), a burlesque of the Donizetti style which despite a melodic eclecticism developed a creative style of its own, The Medium (qv), a contemporary example of verism, Sebashan, a ballet; Errand Into the Maze, a ballet produced by Martha Graham, a Piano Concerto, a Pastorale for string orchestra, and Variations on a Theme of Robert Schumann which won the Lauber Musical Award in 1931. In 1946 he began work on another comic opera, The Last Superman, after winning the Guggenheim Fellowship award of \$2,500. In the summer of 1947, he directed his own play, A Copy of Madame Aupu, at New Milford, Conn.

MENPES, Mortimer, English artist b Adelaide, South Australia, 1859, d April 1, 1938. He went to London when 19, studied at South Kensington, spent three years in Brittany at Pont Aven, traveled throughout Europe, Asia, and Mexico, and wherever he went continued his early experiments in color and his attempts to reproduce the atmosphere of various localities. He revived the lost art of printing in color from etched plates; made some excellent dry point etchings, notably one of Hals' Archers of Saint Adrian During 1900 he was war correspondent in Africa for Black and White. He also supervised the reproduction of The Menpes Series of Great Masters Among his publications are War Impressions (1901), World Pictures (1902); The Durbar (1903), Whistler as I Knew Itim (1904), India (1905); and Sir Henry Irving and Thames (1906).

MENSA, or MONS, in astronomy, one of the 14 constellations which Lacaille discovered at the Cape of Good Hope It is named from the mountain which is a conspicuous feature of the landscape at the Cape The constellation is a very meonspicuous one near the South Pole, its brightest star being only of 5.3 magnitude.

MENSTRUATION, the periodical discharge of the menses or bloody fluid from the female generative organs. In women it normally occurs at intervals of one lunar month, or 13 times a year (hence the use of the term menses, Latin plinal of menses, month) Its first appearance marks the stage of puberty, and is usually attended by definite changes enlargement of the breasts, showing development of the mammary glands, growth of the ovaries, of the uterus and external genital organs, etc., and by other signs, physical and mental, of approaching womanhood It usually begins in temperate and maturity climes between the 13th and 15th year, in hot climates it is apt to commence as young as 12 years, and in very cold climates as late as 17 years, its periodic recurrences continue until the menopause (qx) or final cessation of the discharge, which ordinarily arrives somewhere be-tween the 45th and 52d years. The recurrent periods of its appearance, as well as their dura-tion, vary with different females, and not infrequently in the same individual, the variations, however, not always indicating abnormal or nathological causes. The immediate cause of menstruation is the breaking away of an ova or egg from one of the ovaries (See OVARY). Menstruation is often at first, and in many persons throughout the catamenial age, attended by characteristic pains and symptoms, with physiological and psychological conditions of disturbance or depression, which sometimes call for special Invaience treatment. During pregnancy (with exceptional cases) there is no menstrual flow, its cessation being one of the earliest signs of conception. Observance of Observance of wholesome rules of exercise, rest, etc., helps to maintain normal conditions of body and mind, the reverse of which, owing to neglect of such rules, so often makes the menstrual function a visitation of dread and distress.

Disorders of Menstruation. These include amenorthoca, dysmenorthoca, menorthagia and metrorthagia. Amenortheca is an absence of the menstrual flow from some cause other than pregnancy of the approach of the menstrual function. It is a symptom of anemia (qv), or may be due to a constitutional condition such as profound nerve flag of tuberculosis. Strychune, from and ergot may be administered internally of the physician may apply local treatment (See Dysmenorational). Menorthagia is an abnormally profuse flow during the menstrual period, due to one of several conditions. If not checked by rest, a physician is necessary, as also in metrorrhagia, which is a sanguineous flow between the menstrual periods.

MENSURAL MUSIC. Mensural or measured music is a term applied to a historical style of composition in which the tones bore exact relations to each other in regard to length or time. Such a designation and the occasion for it may appear strange, as precise rhythm seems to belong to the essence of music. This, however, is not the case; there was a period when notes were not exactly measured, and mensural music is a subsequent development from this early practice.

All European music of a higher character

was originally cultivated in connection with speech of poetry. This is true of the music of the Greeks as well as the early Christians. But speech is not necessarily rhythmical. Ordinary speech is not so at all, and even poetry is not always characterized by the exact time relations typical of strictly measured music. A trochee can be delivered either in two or three part time, the accented syllable matching the unaccented in direction or requiring double as much time. And in impassioned utterance rhythmical relations are apt to be lost sight of altogether. Moreover, any rhythm which the accompanying tones may possess would be theirs only by virtue of the words to which they are added, it would be a rhythm of the poetry, not of the music.

Such was the case in Greek music. Although institumental performances were also in vogue among the Greeks, music with th m, as we have said, was primarily vocal. We know hitle of its exact character, but are probably justified in regarding it as a species of recitative, the words guiding the course of the tones In Christian times the earliest fixed type of the art was the Ambrosian chaut, formulated by Saint Ambrose of Milan in the 4th century This, too, was similar to Greek music in its adherence to the rhythm of the words change was wrought by Pope Gregory the Great, two centuries later What distinguishes his chant from the Ambiosian is supposed to be the uniform length of its tones, giving it a character similar to that of our choral How-ever, this is probably true only in part. According to the historian Ambros, the sections of the chant which were sting by many voices may have been measured and regular, but the utterances of the priest must have retained much rhythmical variety. The real difference is formulated by him as follows: "The Ambrosian chant was based essentially on the poetical metre, the Gregorian on the musical. What-ever the exact nature of the difference, however, there is no doubt that Gregory effected a liberation of the tones from the rhythmical shackles of the words And this was a gain of far-reaching importance. Music had now won its independence, and the way was prepared for the development of mensural composition.

The more immediate occasion for this development was the introduction of harmony. Just as music had primarily been vocal, so also it had been unisonal in character. Though a second tone may occasionally have been added to the principal part, nothing like the later polyphony was attempted. In the 9th century, however, the so-called Organum of Huchald makes its appearance. In this the theme is systematically accompanied by one, two or three other voices, singing intervals of a fourth, fifth and octave in parallel motion. The point was now reached beyond which no further advance was possible without an exact designa-tion of the length of the notes. As long as the singing had been confined to a single person this was not necessary Nor was it necessary in the case of several persons chanting in unison, if the length of the notes was regulated by the natural accent of the words, or if all the tones were of equal length. In the Organum, however, a certain case was already sequired. The singers had to stand so that they could see as well as hear each other, and one among them acted as leader, introducing the new notes at the proper moment. The Organum now developed in various directions. There was a more independent progression of parts, contrary alternating with parallel motion, and the tones no longer coincided with each other note for note, but one voice sang two or more tones while the other sang one. Manifestly this required an understanding as to the relative duration of the tones, and a method of designating the differences graphically. The first person to formulate the solution of this problem was Franco of Cologne, who lived about the year 1200. Previous to him tones of two lengths, the longs and brevis, had already been recognized. He also admitted the duplex longs or maxima,—twice as long as the longs, and the semi-brevis,—half as long as the brevis. The notes in question were represented as follows:

maxima longa brevis semi-brevis

Rests were also indicated by Franco, by means of appropriate signs. The bar-line was not yet in use, but measure was recognized, being at first confined to triple or "perfect" time Duple or "imperfect" time was only permitted at a later date.

There were many complexities in the system as promulgated by Franco and his followers. Thus the length of the notes was not only determined by their own character and appearance, but also depended on the neighboring notes. There were "alterations" and "imperfections," "prolations" and "ligatures," but space will not permit us to enter into all these involved details, which have only a remote historical interest. The rules governing mensural music were further elaborated - among other writers - by Marchettus of Padua, who lived about a century after Franco; and Jean de Muris, a celebrated theoretician of the 14th century Notes of shorter duration were gradually introduced, such as the minima, semiminima, fusa and semi-fusa And the notation too was modified, until it finally assumed the appearance to which we are accustomed to-day. Together with the Organum, mensural music furnished the basis for all subsequent advances in the art. It was the indispensable prerequisite for the growth of rhythmical and contrapuntal variety. It made possible the wonderful development in part writing which was soon to take place in the Netherlands, and which was eventually to lead to the glories of modern instrumental and choral music In fine, it may be regarded as one of the two or three great elementary contributions to the art, on which the dazzling superstructure of modern beauty and inspiration has been erected

Albert Gehring,

Author of 'The Basis of Musical Pleasure,' etc.

MENSURATION. Mensuration is that branch of applied mathematics which treats of the metrical relations of geometric figures, in particular of the length of lines, the magnitude of plane and solid angles, the area of surfaces and the volume of solids The term is used both for the act and for the art of measuring geometric magnitudes. Mensuration is not usually treated as a separate branch of mathe-

matics, but occurs as an integral part of various subjects, such as plane geometry, solid geometry, trigonometry and integral calculus. For a discussion of the measurement of plane, diedial, spherical and solid angles and of the relations between the sides and angles of a triangle (plane or spherical) the reader is referred to the article on Trigonometry The present article will give formulas for lengths, areas and volumes of the simpler and the regular figures and methods of approximation for the more complex or irregular figures

The measure of a geometric magnitude is its ratio to a fixed magnitude of the same kind selected as the unit of measurement. Throughout this article the unit of area is assumed to be a square each side of which is equal to the unit of length, and the unit of volume is a cube whose edges are likewise of unit length. The purpose of a formula is to show how one of these numbers (ratios) may be found from certain others which are supposed to be known or obtainable. Thus formula (XIX) says that the ratio of the area of a circle to that of a square each side of which is a foot long (that is, the area of the circle measured in square feet) may be obtained by multiplying together the ratio of the circumference to the unit of length known as a foot, the ratio of the radius to the same unit of length, and the number 1/2. It is important to recognize that in using any formula the units must all be of the same system. The number of acres in a field can-not be found directly from formula (X) by multiplying together the number of rods in two adjacent sides: this would give the number of square rods in the field. Nor is the number of gallons in a barrel given by formula (LXV) when the radii are measured in feet or in inches, but the number of cubic feet or cubic inches, as the case may be In order to change any measure from one system of units to another the following table may be found useful:

To	change	Multiply by	Inverse
in.	to cm.	2 53998	393704
ft.	to m	.304797	3.28087
miles	to km .	1 60933	.621377
	to sq. cm. to sq. m to acres to acres to acres	6 45148 0929013 0000229568 .000206612	.155003 10 7641 43560. 4840. .0015625
cu. in.	to cu cm to litres to gallons. to gallons	16.3866	.0610254
cu ft.		28 3161	0353156
cu in		004329	231
cu. cm.		000264184	3785.238

[in = inches, ft = feet, yds = yards, sq = square, cu = cubic, m = meters, cm = centimeters, km = kilometers].

(For other multipliers see Weights and MEASURES). The second column of figures serves to change the unit in the opposite way to that indicated by the rest of the table: thus to change meters to feet multiply the number of meters by 3 28087; for instance, 10 meters is equal to 32 8087 feet.

In many cases the computation of area or of volume may be accomplished most easily by mechanical means. For the measurement of the area of plane figures ingenious and effective instruments known as planimeters have been invented. Two historic instances are the finding by Galileo of an approximate value for the area of a cycloid by cutting it out of a sheet of copper and weighing the model, and the discovery by Archimedes of a fraud in Hiero's new crown through measuring its volume by submersing it in water and measuring the water displaced. To apply this last method multiply the number of ounces of water by 173, or less accurately by 7, and the result will be the number of cubic niches in the object; or, measure directly the volume of the water displaced.

LENGTH OF LINES.

Circle.-- The circumference of a circle is equal to the diameter multiplied by 3.14159265358979323846264338328

This constant is usually denoted by the Greek letter π (pi) and is approximately equal to 31, 355, or 3 1416.

Use the first if an error of one two-thousandth of the final result may be neglected, and the last if an error of one four-hundred-thousandth is negligible.

The above theorem may be written

$$\begin{array}{ccc}
l & \pi d, \\
& 2\pi r,
\end{array} \tag{I}$$

where l^- length of circumference, a = diameter and regradius

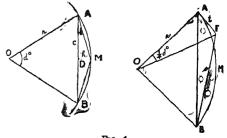
The length I of the arc AMB in Fig 1, in which MD is the perpendicular at the middle point of the chord AB, AB is tangent to the OE is perpendicular to the radius OA, the arc of the angle AOE is one-fourth of the angle AOB, may be found by any one of the

$$l = \frac{\pi}{180} dr, \quad \frac{\pi}{180} = \frac{1}{57}$$
 (error about $\frac{1}{200}$) (II)

$$l - c + \frac{8}{3} \frac{h^2}{c}$$
, (III)

$$\begin{array}{ccc}
l & 2k + \frac{1}{3}(2k - c), \\
& - \frac{1}{3}(8k - c),
\end{array}$$

in which d number of degrees in the angle AOB, r radius O.A, c chord AB, h = height MD, k chord of half the arc AM, t = length



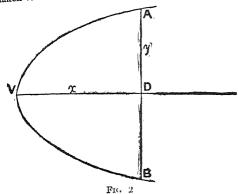
, Frg. 1.

of AE, and sr^{-1} length of BE. Formulas (III), (IV) and (V) are only approximate, the error being small only if the angle AOB or the ratio of h to c be small. Thus for an angle of $d=90^{\circ}$ the arc is $1.5708\ldots$, whereas formulas (III), (IV) and (V) give $1.576\ldots$, $1.5696\ldots$, 1.5732.., respectively.

Parabola.—The length 1 of the arc AVB of the parabola in Fig 2 is

$$l = \sqrt{y^2 + 4x^2} + \frac{y^n}{2x} \left(\log^2 x + \sqrt{y^2 + 4x^2} \right) , (VI)$$

11D, and the logarithm is where x = VD, y taken to the base e



Ellipse.—The length l of the circumference ABA'B' of ellipse in the next figure (Fig. 3), in which F and F' are the foci (BF = BF')=(0A), 18

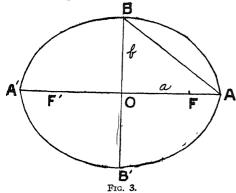
$$l = 2\pi a (1 - \frac{1}{2}e^{\alpha} - \frac{1}{8}e^{\alpha} - \frac{1}{2}\frac{1}{5}e^{\alpha} \dots), \quad (VII)$$

or approximately

$$\frac{1}{l} - \pi \sqrt{2(a^2 + b^2)}$$
= 4.443*d*, (VIII)

where e is the eccentricity $\left(OF/OA = \frac{1}{a}\sqrt{a^2-b^2}\right)$;

a = OA, one-half the longest diameter; b = OBone-half the shortest diameter; $d = AB - \sqrt{a^2 + b^2}$.



General Methods of Approximating the Length of Any Curved Line.— Divide the line into parts each of which differs but little

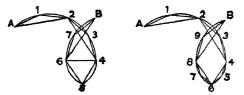


FIG. 4.

Then each portion from a small circular arc. may be found by any one of the formulas (III), (IV) or (V). A convenient method for the

use of formula (IV) is indicated by the diagram herewith (Fig. 4) and formula (IX). The only restrictions upon the location of the points 1, 2, 3, 4, . . in addition to that given above is that the odd-numbered ones must be half-way between the others and that there should be an odd number of points in all.

$$l = (\overline{A1} + \overline{12} + \overline{23} + \dots) + \frac{1}{3} (\overline{A1} + \overline{12} + \overline{23} + \dots) - (\overline{A2} + \overline{24} + \overline{46} + \dots)] \quad (IX)$$

Area of Plane Figures.

Rectangle.— The area a of a rectangle, the lengths of two adjacent sides of which are b and c respectively, is

$$a = bc$$
 (X)

Triangle.—The area a of the triangle ABC (Fig 5) is

$$a = \frac{1}{2}hb,$$

$$a = \frac{1}{2}bc \sin A,$$

$$a = \sqrt[4]{s(s-a')(s-b)(s-c)},$$

$$(XII)$$

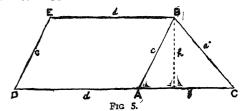
$$a = \frac{1}{2}b^2 \frac{\sin A \sin C}{\sin (A+C)};$$

$$(XIV)$$

where a', b, c are the lengths of the sides BC, CA, AB, respectively; h is the perpendicular distance (height) of B from AC; s is one-half of the sum of the sides: $s=\frac{1}{2}(a'+b+c)$.

If one angle of the triangle (say A) is a right angle, both formulas (XI) and (XII) simplifies namely the era is one-half the production.

simplify: namely, the era is one-half the product of the two sides which enclose the right angle $(a = \frac{1}{2}bc)$ For a simple method of finding the area of an equilateral triangle (a' = b = c) multiply the square on one side by $\frac{13}{20}$ $(a = \frac{13}{50}b^2$, approximately), see formula (XVIII).



Parallelogram.—The area a of the parallelogram ABED (Fig. 5) is

$$a = d h, (XV)$$
or
$$a = cd \sin D, (XVI)$$

where c and d are the lengths of two adjacent sides, D is the angle between them, and h is the perpendicular distance between the two parallel sides whose length is d

Trapezoid.—The area a of the trapezoid ED (Fig. 5), any four-sided figure with CBED (Fig. 5), any four-sided figure with two of the opposite sides (BE and DC) parallel, is (XVII)

 $a=\frac{1}{2}h(d+e),$

where h is the perpendicular distance between the two parallel sides and d and e are the lengths of the parallel sides (d = BE, e = DC).

Regular Polygon.—The area a of a polygon bounded by n equal sides each of length s and having its n angles all equal is

$$a = s^2 \times \frac{n \cot \frac{180^\circ}{n}}{4} . \tag{XVIII}$$

The following table gives (approximately) the value of the multiplier in the simpler cases:

The second secon		
Name	71	$\frac{n\cot\frac{180^{\circ}}{n}}{4}$
Triangle Square Pentagon Hexagon Octayon Nonagon Decagon Undecagon Dodecagon	3 4 5 6 7 8 9 10 11	433013 1 1 72048 2 59808 3 64391 4 82843 6 18182 7 69421 9 36561 11 19615

Thus, for instance, if the side of a regular hexagon be 9 feet, its area is 81×259808 210 4445

Irregular Polygon.—The area of an 11regular polygon may be found by dividing it into parts each of which is a triangle, parallelogram, rectangle or trapezoid. Thus it we draw a system of parallel lines across the polygon, one through each vertex, each part will be a triangle or trapezoid and its area may be found by formulas (XI) or (XVI).

Circle.— The area a of a circle, whose radius is r and whose circumference is l, is

$$a = \frac{1}{2}lr,$$
 (XIX

 $a = \pi r^2$ $\pi = 3.1416 = \frac{3}{7}^2$ (nearly) (XX) The area a of the sector OAMB (Fig. 1), in which l is the length of the arc AMB and d is number of degrees in the angle AOB, is

$$a = \frac{1}{2}lr, \tag{XXI}$$

or
$$a = \frac{\pi}{90} dr$$
, $\frac{\pi}{90} = .034906585 = \frac{1}{20}$ (nearly)

The area a of the segment AMBD (Fig. 1) is $a = \frac{1}{2}r(l - r \sin d^{\circ}),$ (XXII)

$$a = \frac{2}{3}ch + \frac{h^3}{2c}$$
 (approximately), (XXIII)

Of

$$a = \frac{2}{3} \iota h$$
 (approximately), (XXIV)

where r, l, c, h, d have the same meanings as in formulas (II), (III), (IV) and (V). Parabola.—In Fig 2 the area a of the segment VABD with base AB = 2y and height VD = x is

$$a = \frac{4}{3}xy$$
. (XXV)

Ellipse.— In Fig. 3 the total area a' of the ellipse ABA'B', of which the length of the longest diameter A'A is 2a and the length of the shortest diameter BB' is 2b, is

$$a' = \pi a b, \quad \pi = 3.1416$$
 (XXVI)

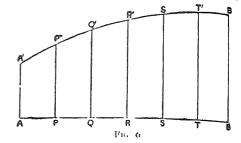
General Methods of Approximation .-Any plane area can be divided into parts each of which is a rectangle or differs from a rectangle in that one side is a simple curve as in Fig. 6. It is therefore sufficient to give methods by which an area, such as ABB'A' following, may be measured

1. The Trapezoidal Method.— Divide the base line AB into any number of equal parts, AP, PQ, QR. . , TB and erect the perpendiculars PP', QQ', . . , TT' Then if each portion A'P', P'Q', . . . , T'B' of the curve

A'B' is nearly coincident with its chord, the area a 15

$$a = \overline{AP}[(AA' + PP' + OO' + ... + \overline{TT'}) - (AA' + \overline{BB'})]$$
 (XXVII)

2. Simpson's Rule. - Divide the base line into any even number of parts (in Fig 6 it is



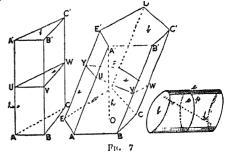
divided into six parts), erect the perpendiculars as before. Then

3 Weddle's Rule. Divide the base into exactly sir equal parts (as in Fig. 6), then

$$= \frac{1}{20} \overline{AB} \left[5(PP' + RR' + TT') + \overline{RR'} + \overline{AA'} + QQ' + SS' + BB' \right] \quad (XXIX)$$

SURFACE AND VOLUME OF SOLIDS

This includes any solid two of Prism whose faces, known as the bases, are equal polygons situated in parallel planes and all the other faces, the lateral faces, are parallelograms Thus in the following diagram (Fig 7) the polygons ABC: and A'B'C' are the bases and the parallelograms AA'B'B, BB'C'C, are the lateral taces. The edges AA', BB', CC', are the lateral edges. The polygon B'B'. Lying in a plane perpendicular to one, and to the all of the lateral edges. and so to all, of the lateral edges is called a right section. The right section is equal to the base if and only if the lateral edges are perpendicular to the base



For the lateral area a which is the sum of the lateral faces AA'B'B, BB'C'C . , and the volume v of a prism we have the formulas

a prism we have the formulas
$$a \quad c(\vec{l}\vec{l'} + \vec{l'}\vec{lV} + \dots), \quad (XXX)$$

$$v \quad cs, \quad (XXXI)$$

$$v \quad hb, \quad (XXXII)$$

in which c length of a lateral edge (AA' or BB'...), s area of a right section (UVW...), h height, i.e., distance between bases, b area of a base

The volume v of a truncated triangular prism, that is one with three lateral faces and whose bases are not parallel (therefore the lengths $e_1,\ e_2,\ e_3$ of the lateral edges not equal)

$$v = \frac{1}{2}s(e_1 + e_2 + e_3).$$
 (XXXIII)

Any truncated prism may be divided into truncated triangular prisms and its volume thus found. For a four-sided prism whose opposite lateral faces are parallel this gives

$$v = \frac{1}{2}(ec \mid ec)s,$$
 (XXXIV)

where et, et are a pair of opposite edges

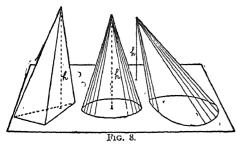
Cylinder. This includes any solid having two bases which are equal plane figures bounded by curved lines (such as cucles, ellipses or inegular figures), and situated in parallel planes, and the rest of the surface of the solid such that it may be thought of as consisting of an infinite number of parallel straight lines. If we call the length of each of these (equal) parallel lines c, the formulas for the prism given above (XXX, XXXI, XXXII) apply also to the cylinder, namely, the lateral area a and the volume vaic

where p is the length of the boundary, and s is the area of the section of the cylinder by a plane perpendicular to one of the lines lying on the lateral surface

If the right section of a cylinder be a circle, the base, unless a circle, is an ellipse and its area is found by formula (XXVI). If in such a circular cylinder the bases are not parallel and the distance between the centres of the bases is l, then the area a and the volume v are

where r is the radius of the right section. These formulas are equivalent to (XXXV) and (XXXVI) when the bases are parallel, since then l - c

Pyramid and Cone.—The volume v of any solid, such as those in Fig 8, whose sur-



face consists of a base, which is a plane figure of any kind, triangle, polygon, circle, ellipse, etc, and of triangles or curved areas which may be thought of as composed wholly of straight lines, joining the boundary of the base to some point (the vertex) not in the same plane as the base, is

$$v = \frac{1}{3}bh$$
, (XLII)

where b is the area of the base and h is the perpendicular distance (height) of the vertex from the plane of the base.

For a right circular cone, that is one in

which the base is a circle and the line joining the vertex to the centre of the base is perpendicular to the plane of the base, the area a of the curved (lateral) surface is

$$a = \pi re$$
, $\pi = 3 1416$ (XLIII)

where r is the radius of the base and e is the distance from the vertex to any point in the cucumference of the base

Prismatoid.— The volume v of any solid, whose total surface consists of two plane figures (the bases), of any character whatever, lying in parallel planes, and a lateral surface made up of triangles, trapezoids, or curved portions which may be thought as made up of straight lines joining the boundaries of the bases, is

$$v = \frac{1}{2}h(b_1 + b_2 + 4m), \quad (XLIV)$$

where h is perpendicular distance (height) between the bases, b_1 and b_2 are the areas of the bases, and m is the area of a section of the solid by a plane parallel to and half-way between the planes of the bases; or

$$v = \frac{1}{4}h(b+3q),$$
 (XLV)

where b is one of the bases and q is the area of a section parallel to and two-thirds of the way from, that base to the other

Solids of Revolution. Sphere. The area s of the surface and the volume v of a sphere of radius r are

$$s = 4\pi r^2$$
, $4\pi = 12\ 56637\dots$ (XLVI)
 $v = \frac{4\pi}{3}r^3$, $\frac{4\pi}{3} = 4\ 18879\dots$ (XLVII)

$$v = \frac{4\pi}{3}r^3$$
, $\frac{4\pi}{3} = 4 \ 18879 \dots$ (XLVII)

The volume v and lateral area a of a segment of a sphere (that is the part lying between two parallel planes) are

$$v = \frac{\pi}{6}h[h^2 + 3(r_1^2 + r_2^2)], \quad \frac{\pi}{6} = 5236... \text{ (XLVIII)}$$

$$a = 2\pi hr. \quad \text{(XLIX)}$$

where h is the height of the zone (perpendicular distance between the parallel planes of the bases), r_1 and r_2 are the radii of the bases respectively, r is the radius of the sphere.

Spheroid.—For a prolate spheroid, that is the solid formed by revolving an ellipse about its longest diameter (in Fig. 3, about AA'), the area s of the surface and the volume v are

$$s=2\pi\left(b^2+\frac{ab}{e}\sin^{-1}e\right), \qquad (L)$$

or
$$s=2\pi b(b+fa)$$
, (approximately) (LI)

where $a,\ b$ and e have the same significance as in (VII) and (VIII) and

$$f=1+\frac{1}{6}c+\frac{3}{4}{5}c^2+\frac{5}{112}c^3+\frac{3}{112}c^4+\frac{6}{2}\frac{3}{3}\frac{7}{3}c^5+\dots$$
, in which $c=1-\frac{b^2}{a^2}$. Or less accurately

$$s = \frac{\pi}{3} b \left[7a + b \left(6 - \frac{b}{a} \right) \right], \quad \frac{\pi}{3} = 1.0472; \quad \text{(LII)}$$

$$v = \frac{4\pi}{3} ab^2$$
, $\frac{4\pi}{3} = 4.18879...$ (LIII)

The volume v of a segment of a prolate spheroid (part cut off by a plane perpendicular to the axis of revolution) the height of which is h, is

$$v = \frac{\pi}{3} h^2 \frac{b^2}{a^2} (3a - h), \quad \frac{\pi}{3} = 1.047198$$
. (LIV)

For an oblate spheroid, that is the solid formed by revolving an ellipse about its short-

est diameter (in Fig 3, about BB^\prime) the corresponding formulas are

$$s = \pi \left(2a^2 + \frac{b^2}{e} \log \frac{1+e}{1-e} \right), \quad \text{(LV)}$$

$$s = 2\pi (a^2 + gb^2), \quad \text{(LVI)}$$

or

where
$$g = 1 + \frac{1}{3}d + \frac{1}{6}d^2 + \frac{1}{4}d^3 + \frac{1}{3}d^4 + \frac{1}{17}d^6 + \cdots$$

in which

$$d=1-\frac{b^2}{a^2};$$

$$v = \frac{4\pi}{3} ba^2$$
, $\frac{4\pi}{3} = 4 18879 \dots$ (LVII)

The volume v of a segment of an oblate spheroid is

$$v = \frac{\pi}{3} h^2 \frac{a^2}{b^2} (3b - h).$$
 (LVIII)

Paraboloid.—The volume v of the solid formed by revolving VAD in Fig. 2 about VD as an axis is

$$v = \frac{\pi}{2} x y^2, \quad \frac{\pi}{2} = 1.5708 \dots,$$
 (LIX)

which is just one-half the volume of the cir-

cumscribing cylinder

The General Solid of Revolution.—The volume v of the solid formed by revolving any curve about a line lying in the same plane and not intersecting it, for instance by revolving A'B'BA in Fig 6 about AB as an axis, is

$$V = \frac{\pi}{3} \cdot \overline{AP} [\overline{AA'^2} + \overline{BB'^2} + 2(\overline{QQ'^2} + \overline{SS'^2} + .) + 4(\overline{PP'^2} + \overline{RR'^2} + .)]. \quad (LX)$$

Or, as it is perhaps usually easier to measure the circumferences of the circles generated by PP', etc., than their diameters, if we denote the circumferences generated by A', P', Q', ..., B' by a, b, q,..., b, respectively, the above formula may be written

$$v = \frac{1}{12\pi} \cdot \overrightarrow{AP}[a^2 + b^2 + 2(q^2 + s^2 + \dots) + 4(p^2 + r^2 + \dots)],$$

$$\frac{1}{12\pi}$$
 = .0265258 . . . (LXI)

The Regular Solids.—The area of the surface and the volume of the five regular solids may be found by means of the multipliers given in the following table:

NAME	Area == (edge) ² ×	Volume == (edge)3×	(LXII)
Tetrahedron Cube Octahedron Dodecahedron Icosahedron	1 7320508 6. 3.4641016 20 6457788 8 6602540	.1178511 1. 4714043 7 6631189 2 1816950	

General Method.— The volume of solids which do not come under any of the types treated above may be measured by an application of the prismatoidal formula (XLIV) Let $a_1, a_2, a_3, \ldots, a_{2n}, a_{2n+1}$ be the areas of a set of plane sections parallel to a suitably chosen base and dividing the solid into an even number (2n) of portions; a_1, a_{2n+1} being the end sections (that is, the solid lies wholly between a_1 and a_{2n+1}). The distance between consecutive cutting planes is to be the same throughout and to be taken so small that between the odd-numbered sections the solid is approximately a prismatoid. The area of a section may be

found by surrounding it by a rectangle and measuring (by XXVII, XXVIII or XXIX) the portion of the rectangle outside of the section. If the distance between the sections be h_i

$$v = \frac{1}{12}h[a_1 + a_{2n+1} + \frac{1}{2}(a_2 + a_4 + a_7 + \dots + a_{2n-1}) \\ + \frac{1}{2}(a_1 + a_4 + a_4 + \dots + a_{2n})]. \quad (LXIII)$$

Barrel.—If d be the inside diameter of the end of a barrel, ϵ the inside diameter at the middle, and l the length (or height) of the barrel, then the prismatoridal formula (XLIV) gives as the volume τ

$$v = \frac{\pi}{6}I\left(\frac{d}{2} + \epsilon^2\right), \quad \frac{\pi}{6} = .5236.$$
 (LXIV)

The following is said to be a better approximation:

$$v = -\frac{\pi}{9}l\left(d^2 + \frac{5}{4}\epsilon^2\right), \quad \frac{\pi}{9} = .319 \dots$$
 (LXV)

The volume v of the smaller portion of a partly filled barrel, that is, of the contents if the barrel is less than half full and of the empty portion if it is more than half full, is

 $v = .000472h(d \cdot | -a^n + 4b^2), \quad (LXVI)$

where h is the distance of the surface of the contents from the nearest end, a is the diameter at the surface of the contents, and b is the diameter half way between the surface and the nearest end

WILLIAM FINDLAY

MENTAL DEFECTIVES. See CHILDREN, DEFICTIVE, EDUCATION OF PREBLE-MINDED OR MENTAL DEFECTIVES

MENTAL DISEASES. Mental diseases may be of a great variety of types, of great variety on types, of great variation in degree of intensity, ranging from harmless, senseless, such as, for instance, the celebrated saying of the Quaker to his wrig. "All the world is queer save Me and Thee, and methinks at times. Thee is also queer," to the most destructive and violent of afflictions such as in manna, the epileptic furor, or the ecstasies of fanatical fervor. To describe them all would full this volume.

Psychiatry is that branch of medical science that would study, organize that knowledge, and strive to modify, heal or stop mental disorders. It is a very old, possibly the oldest of the arts if not of the sciences, since distorted efforts at trying to modity nature were among the earliest functions of the primitive medicine man, the king or the priest, often combined in early history. Man and his Id have always worked on the pleasure principle. Pleasure is good, pain is bad. Dis-case is some form of pain, hence bad, originally a foreign spirit to be exorcised, as by the primitive medicine man; today, some distortion of reality by a demanding 1d impulse. The pathway travelled from ancient times to the present is worn, and beset with many conflicting ideas about mental disorders. Naturally this would be so when the complexities of mental functioning are taken under consideration. To one who would glimpse this history, the first warning is to be made aware of the tyranny of words. In logical science, it is the disease of nominalism. The Id, roughly analogous to the gasolene of a motor car, is the source of the main chief drives, for good or evil. This power needs to be regulated. Inhibited or repressed are words used

to designate this process, and the «Ego» the reasoning process having this variable function in hand. This is not the «Ego» or «Me» of the layman. Also another important check on the ld comes from an old and yet new source, the Super-ego, ancestrally learned and familiarly relearned principles. Everything we do or think is a balanced activity of these three sets of influences. When the «ld» will not give way to be controlled by the Ego and Superego, and gams its partial satisfaction through a distortion of reality, this, in the Freudian formulation, is a mental disease, a psychosis. Thus as an illustration, the psychosis known as amelancholia," in which depression of mood, slowness of movement and ideas of guilt are the prominent signs. Psychoanalytic study has shown that the Id impulse that, for a variety of reasons, may be set in action, is one of hostility, or aggression, which could lead to murder (cummosis), but the Ego and Super-ego get to work, handling the impulse by a process of repressive incorporation. The love hate object, is incorporated, swallowed, introjected, as the breast was originally swallowed in nursing, and thus devoured. The Super-ego creates the sense of guilt. The Ego has distorted the real object of the ambivalent love and hate, the mother, after converting her into a holy image, even an hallucinatory angel with wings, etc. This is a complicated process. Simpler ones will be pointed out later.

That tendency to make a "word" stand for a «meaning» the most significant of this type of difficulty is the word "insanity," for instance, which has falsely come to be thought of as a synonym of mental disease, because of a 2000 year old faulty connotation. It started, Plmy the elder says, somewhere, with the property and imperial minded Roman lawyers. In those days they had the same difficulties with wills, contracts, murders, etc, etc, as we have today. Problems of responsibility, capacity to remember, etc, were then as now, and the doctors had to be consulted. These doctors were nearly always Greek, or Hippocratic in training. They followed the rules of analysis then as today. The patient was an individual, and he was so and so, or such and such, to which the terms anoia, paranoia, etc, were given. This was too much for the Roman lawyers. Away with your Greek subtleties! We will lump all these diseases and call them insantics. Thus today think most of the lawyers, and the courts of law and the whole machinery of medical juris-prudence. «Insanity,» psychiatry claims, is not a medical conception. It is a legal status made by a court of law. A person never is, but by reason of mental disease or defect «should be declared» to have a certain status before the law Irresponsible for a homicide or theft, in-competent to know the extent of his property and the legal objects of his bounty, or whatever the specific question may be, instead of again using an anachronistic word, calling all of these various grades of social maladaptation, again by one word, insanity. This situation is one of the many that would support Charles Dickens when one of his characters states, «The law is an ass »

In psychiatry as everywhere else in the growth, correlation and codification of knowledge, there is much confusion, overlapping, conflict and lag, but the main pathways through

the jungle can be discerned and reduced to description.

As in all things of the spirit, the Greeks seemed to have been the harbingers of advance Psychiatry began to be studied and understood by them. Some of psychiatry's most recent conceptions had definite and clear expression among the Greeks of the age of Pericles, even if the words used are not those of today. The poets and dramatists of Greece were the original psychiatrists, or as Whitehead puts it, "the ancient Greek tragedians, Aeschylus, Sophocles and Euripides, were the Pilgrim Fathers of the modern scientific imagination." They used the word "Fate" where today science tries to use the word "law" They stressed the innermost motives of many psychoses, and Freud's Oedipus complex conception had its first succinct expression in the dramas concerning the "House of Atreus"

The Greeks, however, were not systematizers in those early days, but they distinguished and described certain forms of mental disease, which descriptions hold today in part, their ideas of causation apart. In rough terms anything then was "bile," just as thirty years ago, everything was bacteria and toxins, and today it threatens to be endocines and allergies. Every new discovery is the rallying point of a horde of devotees who spin off into a vortex of enthusiasm, iich in the gathering of new observations, and ultimately all fall back into the arms of the old Greek conceptions, the oneness of the body, and

ultimately all fall back into the arms of the old Greek conceptions, the oneness of the body, and its wisdom.

Speaking very broadly, man's behavior, both within the organs of his body (organ behavior) and within his social setting (every day behavior) is a resultant of contradictory

day behavior) is a resultant of contradictory or limiting dynamic impulses. Man lives in a world of forces, he himself is a part of that world and only superficially separated from it. Through cons of time and by the process roughly understood as evolution he has come to be able to use for his own advantage and that of his neighbor, some of these forces that move him. Briefly they live within him and are active about him Through evolution, patterns of behavior of survival value have been formed. Trial and error, have moulded these patterns, the good ones, so-called, survive, the bad ones are dropped but not all at once, nor m as sharp a manner as the phrases indicate. There is always a load of both to be managed. Thus man comes into the world with a long history of experience and with the possibility of a host of reaction patterns. Heredity is a name given to the more constant or stable patterns, whether they be organ patterns or social patterns. Thus one may speak of a «liver» as a bit of organized experience (Maudsley), which through cons of time of trial and error has stabilized its structure, learned its job and standardized its behavior. Every organ of the body can be so viewed One organ of the body has grown as a sort of adjustor or regulator, or correlator of all the other organs of the body. This organ is the nervous system, made up of cells like other organs of the body, differing in structure and in function. The functions are, roughly speaking, to regulate and correlate the growth processes (metabolism) of the other organs of the body, to move and remove those organs of the body which have specific sensory and motor functions, and finally

through a process of abstraction to know or feel, or intuit the meaning of the environment, internal as well as external. This last function —a symbolic one—is called mental and by a mental disease, is understood a disturbance of the meaning of the environment, chiefly social.

Broadly speaking then three issues may be distinguished. There are diseases, solely or pre-emmently metabolic; these are mostly dealt with in the sphere known as Internal Medicine, there are diseases of the sensori-motor apparatus, these are mostly thought of as Neurological Disorders, and there are disorders of the symbolic functioning of the body, these are the Mental Disorders. There are very few disorders of the body however in which only one of these functional systems is alone involved. Even Socrates learned from the Thracians this important principle of the oneness of the body and its disorders.

When one comes to view the functioning of the dynamic symbolic systems, that is usually called the mind (statically), one gets insight into a definition of mental disease by a consideration of the Freudian formula of the relative energy activities in the instinct part of life -life and death instructs-love and hate if one will toughly speaking (creation or destruction) which in the formula is called the «ld.» The «Id» already likened to the gasolene of an internal combustion engine, supplies or is the reservon of the creative power, the productive energy. That mental institution which has grown up to be a tester of the reality of the external world is called the «Ego» Scholastic psychology has called it the Reason. Its chief function as a reality tester is to permit, or allow the energy coming from the ld to get its way, but an adaptive way, a useful way It is a repressing mechanism and acts like a brake on the Id energies. To aid it the Freu dian formulation adds another control mechanism, the Super-ego, which is largely built up on parental patterns and old survival values. It has been called «Conscience» in the older static psychologies.

When there is a conflict between the Ego and the Id and the forces of the Id are repressed one speaks of a psychoneurosis. the hysteria psychoneurosis the repressed 1d energy is drained through some bodily symptom —Conversion. In the compulsion neurosis a substitution mechanism ensues. It is like a to the forces of the ld—the Ego has to give way to the environment. This is the formula of a definite mental disease, the psychosis. choneuroses and psychoses are both mental disorders, but differ as to mechanism involved. There are mild recoverable psychoses and se-

vere chronic psychoneuroses.

Classification.—Almost every psychiatrist of repute has attempted a classification of the mental disorders. The subject is one of peculiar difficulty, owing largely to the fact that our intimate knowledge of many of these various

forms is far from complete.

A scheme of classification adopted by Jelliffe and White regards the diseases of the nervous system as falling into three general classes: (1) Those of the physico-chemical systems, affecting the neurology of metabolism, and expressed in visceral neuropathology and diseases of the glands with internal secretions; (2)

those of the sensory-motor systems, including affections of the cramal nerves, the peripheral neurons, the spinal cord, medulla, cerebrum and the nervous system, and (3) those of the psychical or symbolic systems (neuroses, psychoenioses and psychoses). The last contains the manie-depressive group, the paranoia group, epilepsy, dementia precox, exhaustion and toxic psychoses and those associated with irreversible organic diseases, with sendity, and finally idiocy, imbeculity, and teeble mindedness. This last group are the mental diseases

A most detailed elaboration of these appears as the 1935 classification of the American Psy-

chiatric Association

The methods of examination of the nervous system include a questionnaire covering the family history of the patient and his illnesses, and an elaborate physical examination of the vegetative nervous system, of the sensory and motor systems, followed by a thorough mental exammation which in many respects is somewhat similar to the questions of the "intelligence tests" and qualification tests of the army. The psychiatrist comes in contact with a great many diseases whose mental element is very small no greater in fact than that of the so-called physical diseases. The disorders in the physicochemical systems produce diseases with mental aspects, but aspects no more mental than those of the diseases affecting the organs, muscles, glands, etc., to which those nerves go It is only when we come to what are called the neu-roses that we find mental behavior alone or predominantly disordered. These affections were called neuroses or «nerve troubles» on the supposition once accepted that the mental behavior was caused exclusively by some pecultarity, whether called abnormality or merely variation, in the structure of the nerve cells themselves. At the present time, however, scientific thought tends toward the conception that mental disease is determined by the loss of balance between the organism and its physical and psychical environment.

Thus there are nervous systems congenitally so weak that they are practically disintegrated by the conflict of the individual and society, a conflict which is, as often as not, absolutely unconscious, and which occurs in the simplest and least complicated social environment. In such natures mental disease at once appears because of the individual's inability to adapt lumself to the indimentary requirements imposed upon him from without. On the other hand, there are neural constitutions so strong or elastic that they are equal to a very severe stram of adaptation even to extraordinarily complicated environment. Such constitutions will naturally adapt themselves, retaining their own personal equilibrium and health, to conditions which would completely upset a weaker (that is, less adaptable) constitution. It may be here noted that the European wars brought out many such diversities of neural constitution in those subject to «shell shock» or other war psychoses, together with improved methods of testing for congenital neural weakness. These tests have resulted in putting in positions of less nervous strain those who are unable to stand the greater. A similar allotment of individuals to the various tasks of life would naturally result in less nervous disease. For it is evident, when both factors are taken into consideration, the constitutional factor and that supplied by the environment, that mental disease is largely a matter of proportion between the nervous system and the load which is placed upon it. For example, a person who is not obliged to struggle for existence may never develop a mental disease which he would have developed, had he been subjected to the stress of adverse cicumstances, while, on the other hand, his affluence may make him introversional, and, after the age of puberty, cause him rapidly to run counter to the demands of a true social existence

The rôle of the unconscious in the etiology of mental diseases is a dominant one, and the comparative indefiniteness of the delimitations of the various types of mental disorders is due to the newness of any scientific knowledge concerning the unconscious portion of mental functioning. The neurologist should have, though infortunately comparatively tew do, as thorough a knowledge of the unconscious mental mechanisms as can be acquired, in addition to the medical specialist's knowledge of anatomy, phys-

iology and Instology.

But the conflict, conscious or unconscious, which occurs at the psychical or symbolic level of the Ego is manifested in predominantly mental modes in the so-called nemoses, psychoneuroses and psychoses. Of the psychoneuroses the commonest are hysteria, compulsion neurosis and anxiety hysteria. Of the actual neuroses there are anxiety neurosis and neurasthema, while special cases present mixtures of these neuroses. As a mental disease, and not as popularly used to denote an uncontrolled emotional state, hysteria is now regarded as a partial dissociation of the personality, in which certain mental elements, namely, emotions and ideas, have been rejected from consciousness into the unconscious where they have an existence which is at least partly independent—an existence which is of vital importance to the welfare of the individual because it is an existence in which the split-off ideas and emotions have a growth or development of their own. This development is different in hysteria and in compulsion neurosis In hysteria the mental elements, which are repressed from consciousness into the unconscious, direct or control a portion of the libido in such a way that its force has an incidence not upon the world of external reality, as is the case with the average person, but in the shape of work done m some shape or other. On the contrary the incidence of the libido falls upon the physiological functions themselves or upon certain of them through a variety of symbolic selection. This process, which is known as hysterical conversion, produces very many symptoms, mostly of a so-called bodily nature. There results from this a large number of disorders which the general practitioner is prone to regard as having only a physical cause, and he prescribes drugs, which rarely have the desired effect. Possibly the commonest form of this is the hysterical headache, which is rarely recognized of psychogenic origin, although it is so completely analogous to the «nine o'clock illness» of school children, who use this gentle form of unconscious malingering as a means for escaping their responsibilities. «An adult ought to make a call upon a recently bereaved friend.» This is recognized as a distinct obli-

gation but the patient's infantile necessity of escaping reality and seeking pleasure makes the duty seem a very onerous affair. Thus arises a conflict between duty, born of conscious appreciation of the social obligation, and desire, born of the childish inability to make the necessary sacrifice of personal comfort. As a result the patient develops a headache and so, being ill, does not have to go While the mechanism in other hysteric conversions is more complicated, it is no less clearly proved, so that the number of what are ordinarily taken as symptoms having a merely somatic cause, and which are through analysis seen to be merely hysterical conversions, is augmented daily. Disturbances of sensibility, such as hemianæsthesia or insensibility to touch and pain on one side of the body only, disturbances of motility such as choreiform movements, tics and certain occupation spasms, disturbances of speech, sometimes including stuttering, visceral disturbances showing vomiting and diarrhoa, vaso-motor disturbances and emotional disturbances, particularly in cases of great exaltation or depression, are all likely to be caused by the hysterical dissociation before mentioned, in which some mental factor is repressed and therefore driven outside

the pale of conscious control

In compulsion neurosis there is no conversion, which implies a shifting of the libido, ie energy from the external world, which is its natural goal, to the physiological processes of the individual; but there is another kind of shift, namely, from the external world to the mental states themselves. In this condition the numerous physical symptoms mentioned as being found in hysteria are generally absent, but their place is taken by variation from the conventional modes of thinking, Such variations to be sure are far from unpleasant, if they do not become too great, for they add much of piquancy and interest to a person's character. But when the departure from the conventional is excessive and both compulsive and unaccountable, the condition merits the term neurosis and requires treatment from the analyst. There are compulsive thoughts, compulsive doubts, fears, acts, rituals of dressing and undressing or eating for which this kind of neurotic can give no reason. He generally does not attempt to rationalize them but admits he does not know why he always has to act or think in his own peculiar way. Analysis has convinced Freud that "obsessions are always transformed reproaches, returning from repression, which always refer to a pleasurably accomplished sexual action of childhood" and that "the compulsive ways of thinking and acting are only substitutes for the reproaches which are symbolical distortions formed in order to prevent a recognition on the part of the patient of the real meaning, so as to keep from his consciousness a realization of the circumstances of his guilty conduct."

Paranoia is a group of mental diseases containing the paranoia as defined by Kraepelin, and various mixed aberrant forms, some of which are called paraphrenias. In general it is a disease in which there are delusions of persecution that have been pretty well systematized. The disease progresses usually through four rather well-defined stages. In the first the patient is unduly concerned about his health,

and particularly about what goes on around him in relation to himself. That is, he considers more things are said and done with reference to himself than does the ordinary person, and he begins to reason it all out that there must be some agreement in the actions of persons or things around him, usually for his discomfiture or ruin. Hallucinations of hearing are common. The result of his thinking himself to be the victim of persecution is that he sometimes becomes very dangerous, and attacks the persons whom he regards as his persecutors. In advanced cases the system of ideas worked out in justification of the suspicions of persecution or conspiracy is very claborate, and frequently includes falsifications of early memories, which contribute the grain of truth in some of the projected reproaches Another classification of the paranora group of mental diseases is that into two divisions, the original and the arquired, the first being the mevitable development of a character which was of such a constitution as to develop into exactly this form of mental disease, in spite of an environment even partly tavorable to a wholesome life, and the second, the effect of an untoward environment upon a neutral constitution which might in more favorable ciicumstances have escaped this fate. According as hallucinations are or are not present, these groups are further divided respectively into paranora hallucinatoria and paranoia combina-Furthermore the individual cases are described as persecutory, expansive, querulous, litigious, inventive, reformatory, religious and erotic, according to the forms which the more prominent mental symptoms show. A third division of the paranoia group is into delusions of interpretation and delusions of revindication. In the first the erratic element is in the interpretation of the factors of the environment of the patient, who remains otherwise quite clear minded, and in the second there is a tendency toward the formation of a fixed idea, either egocentric or altruistic. As paranoia was considered an incurable, progressive and chronic disease, those cases which through analysis have been shown to have at the basis of them an idea that could be traced out and corrected, and which therefore have been called acute paranoias, necessitated a further reconstruction of the concepts underlying the classification. The result of this is that the content of the mental states in this form of disease is not now considered so indicative as the mental mechanisms involved. This implies again that it is not so much the delusion, or the suspicion itself, or any other of the symptoms, which used to be considered characteristic of the disease, but it is the inability on the part of the patient to adapt his Ego to those ideas which form the so-called content of the paranoid state. The delusion, for example, is found to have been made by the patient for the purpose of making a certain emotion tolerable which he could not get rid of. The removal of the delusion would not in such a case help, for another would have to be supplied in its place, to handle the original emotion, which would itself remain. The emotion or a lack of control over the emotions is thus seen to be the most fundamental cause of the disease. The explanation of paranoia consists, therefore, in the emotional lack of control, which

fixes upon certain ideas and is unable to change them, and turthermore in an exaggeration of the mechanism of projection. (See Mechanisms, Mental). Finally Sigmund Freud states that paramola is dependent upon a homosexual fixation in the psychosexual development of the individual. Treatment of paramola has been more earnest and determined of late, as more and more earest and determined of late, as more and more eases have been handled with greater success, but it is to be remembered that the curable cases are now by many regarded as only paramold forms of other mental diseases, and that the true paramolae is known as paramonae virtually only by the failure of all efforts to improve him. Psychoanalysis is the only means by which any satisfactory knowledge can be gained of the unconscious mechanisms dominating any given case, and only by a thorough study can it positively be determined how much or how little can be accomplished in the way of the apecies. Shock therapy is an aid.

Epilepsy and various convulsive types of reaction including the classical epilepsy, some attenuated torms such as affect epilepsies, and those of gross brain disease, constitute a class of mental disease in which there are well-known physiological and anatomical changes in the brain itself. The disease is apparently hereditary, in the sense that in the history of all epi-leptics there is usually to be found some taint in the family or in collateral branches. The epileptic convulsion of the classical type is a spasm with unconsciousness, preceded by a warning called the airia, and followed by a gradual wakening or a deep sleep. The variations are exceedingly numerous. Modern investigation has shown that there is some assocuation between the epileptic fit and the gratification of unconscious wishes. Epileptics are likely to be of a low order of intelligence and their reactions to be analogous to those of children or infants. Some cases indeed do turn out later to be imbeciles. Treatment is not generally considered to be of avail, except possibly in psychogenic cases, where analysis can sometimes straighten out the complexes of the patient. The best care is secured in the colony plan where training in healthful outdoor occupation is possible

Dementia Precox(Schizophrenia) group of mental diseases contains the so-called dementia simplex, hebephrenia, catatonia, some paranoid forms and certain mixed or atypical states. The mental symptoms of the dementia precox group include an emotional duliness which is thought to be due to the fact that in this disease the patient shuts himself into his own thoughts and is therefore less moved by external occurrences than are ordinary persons. That is, his thoughts lose their reference to external reality and the result in the worst cases is that nothing in external reality can move or arouse the confirmed dementia piecox patient. Another feature which is an outcome of this segregation from external interests is or doing it as negatively as possible Thus, if he is told to hold out his hand, he puts it behind his lack; if told to stick out his tongue he shuts his mouth tight. This segregation of the helpowier from all relations with external the behavior from all relations with external reality (and in the last analysis reality amounts to little more than the relations of the individual with other persons), is a splitting of the personality, which is the reason for the alternate name of dementia precox, schizophrema or «split mind.» The detailed features of this separation of the behavior from all that in the average man is in close connection with his behavior are as numerous as all the possible types of relation of the individual with his environment. Some of these are suggestibility, failure of voluntary attention, disturbance of orientation, disorders of memory. The delusions have been shown in many cases to be symbolizations of the conflict going on in the meonscious. The fact that the conflict is unconscious accounts for the difficulty of getting at it and of re-establishing satisfactory relations with the patient. Other symptoms are bodily such as the mannerisms, stereotyped modes of action, unusual words or expressions so frequent in dementia precox, and the rigidity and stippor which characterize some of the patients

Whatever reactions to the environment remam in the patient are marked by an archaic or primeval character, such that in the evolution of human behavior the highest, most complicated and latest acquired types are those first to be lost. In the disease the individual reverts or regresses to a form of behavior which may possibly be supposed to have been valid and current in prehistoric ages. As behavior may be regarded as built outward from a central core, this form of psychosis is what is known as an introversional one, that is, one in which the libido introverts or regresses to a more fundamental and therefore more archaic form of gratification. There are other physical concomitants sometimes noticed, such as an unusually small heart or a tendency to pulmonary tuberculosis. The onset of the disease is either gradual or sudden. If gradual it may be mistaken at the beginning for other types of mental disease, such as the manic-depressive, hysteria, compulsion neurosis, etc. It is in this disease more difficult than in most others to make any satisfactory statement as to whether it has a physical or a mental origin. As the bodily changes so far discovered have been so few and their bearing so uncertain, it is more advantageous at the present time to explain the disorder on a purely psychological basis. The patient is faced with a situation in which the balance between environment and congenital ability to adapt to it is provisionally lost, whether because of the disproportionate burden placed upon him by his environment or because of his innate weakness rendering him unable to support the average load. In this connection it is to be remembered that many ordinary persons declare their burden is too heavy for them to bear, and that few ever know their extreme abilities; consequently the loss of balance may have a purely psychical cause lying within the unconscious desire of the particular person When a person says that something will drive him crazy, he is unwittingly expressing an unconscious desire, not to become ill mentally, but to receive the care and symbolic homage which is given to the mentally ill. The severity of the mental symptoms may be regarded as a measure of how far the unfavorableness of the environment has driven back the individual patient from reality. There are cases of moderate confusion which appear in almost all respects perfectly natural persons, and only later develop a disorder great enough to dissociate them from their fellows, while in the so-called catatonic cases the inability is generally complete. The cases which have subsequently become well have gradually made an adjustment to reality in some form, either indirectly through the formation of delusions, or directly by a final domination of the reality motive. Cases that do not get well tend to sink to lower levels till they reach one on which they can succeed in maintaining themselves with comparative steadiness. This is notably the case in institutions, while in the world of life such persons join the ranks of tramps, prostitutes and petty criminals, thus finding their appropriate level.

The treatment of the bodily signs as such is usually of no service, the treatment of the mental condition must take into consideration the involvement of the higher or psychological levels of the personality and give as much analysis as possible, in order to reconstruct the social relations if that can in any way be done. Prevention of this disease is one of the most important ends that could be achieved by civilization, and is primarily attained through eugenic methods, lacking which the only means at present known he in the correction of all irregularities of character as early as they may be observed in childhood and an absolutely frank and scientific handling of the question of sexuality, the source of much that is anomalous in human be-

havior.

A division of infection and exhaustion psychoses comprises those resultant upon fever, exhaustion or collapse such as from typhoid fever. While all these diseases have mental aspects, the treatment of them is so essentially in accordance with the disease of which they are themselves virtually only the symptoms that they need not be described here in detail. There is a special form of mental reaction following the over-indulgence in alcohol, in opium, cocaine, bromides, carbon monoxide, lead, mercury or from uremia, diabetes mellius, pellagra and certain gastro-intestinal diseases In none of the mental diseases is the matter of individual psychology more important than in alcoholism, as the reasons for drinking which are assigned by people in general are mostly rationalizations. (See Mechanisms, Mental). The real cause why people drink to an extent which harms them is that their neural constitution craves the gratification which they get from this source alone The very fact that a man or woman cannot stop drinking therefore stamps them at once as having a weakness in their mental organizations. The alcoholic takes his peculiar way in creating an artificial balance, so to speak, in order to make up for the loss of balance between his mental organizations and the demands made upon it by his environment. It is his way of taking the cash and letting the credit go. Alcohol is the quickest path for some persons to shut out the world of reality, which has been found too arduous, and to open up the world of fantasy, the fact that the individual is unable to face reality being the really important point Accordingly it is not surprising to find that ordinarily the alcoholic is in other research. is in other respects, aside from his alcoholism, an example of general inefficiency. His unconscious appreciation of his essential inferiority is partly what leads him to flee from the world

of reality to the world of intoxication fantasy. That alcoholism is an indication of a deep psychological weakness, too, is to be inferred from the high mortality in pneumonia and other diseases among alcoholics. There is the wish to die

The same remarks could be made about the mental aspects of indulgence in opium, morphine, cocaine and other poisonings. amount that any given individual can stand depends, as is well known, on the mental organiza-tion. The more he can stand, the stronger the mentality, but from another point of view, the greater need he has for some drug to change, through its effect upon himself, the nature of his relations with the external world, the weaker he is as a mechanism and the less suited he is for the field of activity in which he finds himself. In all of these drug indulgences the treatment of the patient by means of other drugs is merely palliative and does not go to the root of the matter. The only hope of doing this is through psychoanalysis, after the acute disturbance has ceased There are psychoses, too, associated with organic diseases such as apoplexy, chorea, paralysis, multiple sclerosis, polynemitis and heart disease; also with presentle, sende and

arteriosclerotic conditions.

Finally feeble-mindedness, idiocy, imbecility, regarded as defects in personal endowment or development, have the mental aspect that they cannot live in society acceptably to the degree of being either self-supporting, or of supporting anyone else. The economic importance of these defective classes is being recognized and the more as psychological methods have been devised for grading all individuals into the classes which show characteristic differences parallel with the differences between children of ages between 1 and 14 years of age Very extensive researches by Binet, Simon, Goddard and Terman have shown that the general intelligence grows steadily up to age 14, while above that age there are roughly three groups, the low, average and high adult intelligence. What is meant by feeble-mindedness, imbecility and idiocy can be given a very exact form in a table like the following:

4 years Tries to help 5 years Only simplest tasks. 6 years Tasks of short duration. Washes dishes. 7 years Little errands in house Dusts 8 years Dusts 8 years Heavier work simple describe. 9 years Heavier work Scrubs, mends, lays bricks, cares for room. 10 years Good institution helpers Routine work 11 years Fairly complicated work with only occasional oversight 12 years. 12 years Tries to help Middle class in becile. Low class in becile. Low class in becile. Low class in becile. Low class in becile. Middle class in ord Low class moron Middle class moron	Mental age	Capabilities	Class
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	12 years	Uses machinery Cares	Middle class moror
vision. Cannot plan High class moron			High class moron

The advantages of these so-called intelligence tests, so clearly shown in the organization of the national army, are of further advantage in finding out whether a mental defect is inherited or acquired, because in the inherited mental defects a termination of the individual's ability to go through the tests is quite even. He can do all of the tests of ages one to seven, for example, but cannot do any of those above that age. On the other hand the case is not so clean cut with acquired defects, the individual being able to do some but not all of those tests several years above his mental age and not all of them below it.

In conclusion it should be emphasized that the mind and the body are one unity and whatever affects the one is not without effect upon the other, that it is almost it not quite impossible to draw the line between mental and bodily disorders, and that the ultimate truth will be found in the statement that mind is but the function of body and body but the perceptible expression of mind. Therefore few diseases can be regarded as exclusively mental and but few as exclusively physical. Consult Jelliffe and White, Diseases of the Nervous System' (6th ed 1935); Bleuler, Psychiatry' (trans by Brill); Henderson and Gillespie, Psychiatry' (New York 1936); Memininger, K. A., The Human Mind' (1930).

MENTAL HYGIENE. Hygiene has usually been conceived of as a system of measures for the creation of conditions without for the maintenance of the bodily health Mental hygiene is an effort to create favorable conditions within which will make for mental health. Whereas hygiene heretolore has dealt with external conditions which are favorable to health, such as tresh air, sunshine, pure food, exercise, etc., mental hygiene deals with the principles of right living as they apply to the regulation of our thoughts, our feelings, our activities. In its practical applications mental hygiene attempts to deal with the problem presented by the tremendous demands of our fundamental instructs for adequate expression. It sees in human failures mability to adequately harness these instincts, while in success it sees them adequately expressed in activities that are at once creative and socially acceptable and valuable. The principles of mental hygiene receive their formulation as a result of an understanding of the development of the human mind from earliest intancy to adulthood expressed in terms of a constant interplay and compromise between instinctive desires and social repressions. These principles will receive their application along two main lines of endeavor. One by applying them to the scheme of education, modifying it and minimizing the severity of these conflicts, and secondly, in individual instances by an examination of the particular situations under which difficulties have produced disturbing symptoms in the individual.

As soon as the difficulties of the individual are seen as evidences of his endeavor to make his particular instinct-constellation fit in with the social requirements, it is seen that a vast amount of convention, particularly the criminal law, is the reaction of society against instinctive manifestions by an effort at foreible repression, and just as education would not be complete if it stopped wholly at efforts of repression just so mental hygiene points out that society's methods of dealing with its delinquents are not complete when measures of repression, censure and condemnation alone are used. As

in dealing with the child it is necessary to search for and help to develop all the positive characters of value, so in dealing with the delinquent it should be society's effort to search for and develop to their fullest extent all those strivings for better things which no one is with-

This new point of view is applicable to every relation which involves the individual and society, and its ideal must be to bring about a state of understanding rather than a blind clashing of instincts between these two. When this is done individual instinctive indulgence, instead of being met by blind social condemnation, will be met by an intelligent vision which sees the indulgence as a relatively infantile, undeveloped type of reaction and which sets about to bring to pass a different reaction formula by methods of repression where necessary and to the extent necessary carefully checked by adequate controls but which does not neglect those educational procedures without which no repression is safe

The practical application of the principles of mental hygiene must come about as a result of a more complete understanding of the developmental stages of the human individual and this means specifically a more complete understanding of the development of the child. This is the "century of the child" and in many ways the advances that have been made in child study point the way toward an adequate hygiene of mind. This is so because in all of the defective and delinquent conditions, as we find them either in children or adults, we see evidences of defective psychological development either gross or in detail. In other words, the adult delinquent, or the mentally ill adult, presents distinct evidences of having been arrested at some point in his psychological development, so that in that portion of his behavior which is circumscribed by this limitation there are the outward appearances of infantilism or childish-The moods, the grouches, the irritabilities, the petty dishonestres, lying and pilfering, the subtle cruelties and deceptions, selfishness, over-conscientiousness, prudery, emotionalism and a thousand other traits of character are all the better understood when they are seen to be childish types of reaction, and are almost immediately appreciated as such as soon as the analogy is suggested.

The immediate problem of mental hygiene as addressed to such character traits as have been enumerated above is to approach their study in the individual case with a view to unfolding the causative factors which have, within these certain areas of conduct, prevented the individual from progressing along the usual lines of development and having succeeded in this endeavor, helping the individual to find avenues of expression for this pent-up energy in more useful ways.

All these results have been made possible by a study of the development of the child and realization for the first time that the child is not simply a small adult, but has standards of conduct, points of view, attitudes of mind which it is extremely difficult, if not impossible, for the adult to feel himself into An appreciation of these facts, together with an attitude toward the individual which is truly constructive, the parental attitude in the best sense, is what is needed. So that in the treatment of these sick

individuals there is arising in society an attitude which is a development of the parental instinct as a result of better understanding

The defects in the parental instinct have been that children have been considered the property of the parents, existing only for their use and satisfaction. This has been the history of the child throughout the ages. Now it must be applicated that a greater sacrifice is demanded of the parent if the child is to grow up to successful adulthood. Only the interests of the child should be considered by the parent, and not the parent's personal desires. On the other hand, the child should be weaned from considering that the parents belong to it and exist for its pleasure, otherwise a dependent attitude upon the love of the parents will persist into adult life. The basic necessity, therefore, for the healthy adult is a healthy relationship between parent and child which results finally in a normal, healthy emancipation of the latter, resulting in the greatest possible attainment of individual efficiency.

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MENTAL PATIENTS, Family Care of. The term family care as usually employed denotes the maintenance and oversight of an ill or dependent person by a private family for compensation. The less pleasing term boarding out is sometimes used as an equivalent expression

Family care in the United States is best known in connection with the placing of dependent children in foster families by welfare officials Such care has met with general approval and is fast replacing asylum care, which had previously replaced almshouse care.

Three rather distinct systems of conducting the family care of mental patients have gradually come into existence. First, the colony system, which originated at Gheel, Belgium; second, the dispersion system, which is used extensively in Scotland; and third, the annex system which is used in the United States, Germany, and several smaller countries.

Germany, and several smaller countries.

The distinguishing feature of the colony system is a small hospital or community house center which gives temporary care to the mental patients that are to be placed in families. The center also provides headquarters for physicians, nurses, and social workers who look after the patients in the center and supervise those placed out in families.

Under the so-called dispersion system, as conducted in Scotland, mental patients are placed in families by welfare officers under rules promulgated by the General Board of Control of Scotland Such board licenses the homes that may receive patients, passes on the eligibility of patients for family care and inspects, at irregular intervals, the homes caring for patients. The patients placed out have no connection with institutions at the time of their placement. They may, however, have previously been institution patients, and if they become unsuitable for family care, they may then be committed to a hospital or asylum.

The operation of the annex system is in charge of the hospital or other institution to

which the patients have been committed. The physicians of the institution select the patients that are deemed suitable for family care Social workers inspect the homes of families who would like to receive patients and report thereon to the superintendent.

Variations of these major types of care are

in use in different countries.

Family Care in Belgium.—The beginning of family care in Belgium is a matter of tradition rather than history. According to a legendary story, Dymphna, the daughter of an Irish king, was murdered by her father at Gheel in the latter part of the 6th century. Some years later she was canonized and her tomb became the shrine of Saint Dymphia. Among the worshippers at the shrine were many sick persons who came seeking relief from their illness. The mulaculous cures reported caused pilgrimages to be made to the shrine from distant places. A small hospital was built by the village church but it soon proved madequate for its purpose. The visitors, who also overtaxed the small mus of the town, were given accommodations in homes in the vicinity of the shine Some of the sick people stayed several weeks or months with the families that received them.

Family care of the sick gradually became a permanent feature of the town As mental patients stayed longer than others, family care of such cases naturally predominated After many years, family care came under local government regulations. In 1852, the communal facilities of the town became the nucleus of a national colony for mental patients. Ten years later an infilmary was built to accommodate 60 patients. Later the institution was enlarged to care for 100. In 1937, an additional hospital for 100 patients was opened. The colony is administered by a medical director who is assisted by physicians, nurses and social workers work of these administrators is supervised by a high commission and a permanent local committee. The high commission consists of the governor of the province, the King's attorney, the district justice of the peace, the burgo-master of the city and the curé-dean. This commission supervises employe personnel, the medical program, budget and material equipment. The permanent committee is composed of the local burgomaster, local judge, three members designated by the Minister of Justice, and the physicians of the colony. This committee has charge of placing indigent patients in boarding homes, and of maintaining general oversight of homes and pa-

tients. From 1930 to 1939 the patients of the colony notably increased and in the latter year approached 4,000. Approximately 500 patients are admitted and discharged from the colony each year. The families caring for colony patients number nearly 1,800. As a rule each family cares for two patients, although some families may have but a single patient whereas others may have three. The inhabitants of Gheel have accepted the care of patients as a family and community duty. Instruction and community duty. Instruction to young married couples in the care of mental patients is given each winter at the colony center by the psychiatrists on the colony staff. The families thus acquire a high degree of skill in managing patients and are able to care properly

for patients of all classes whether insane, enileptic, or mentally defective

The success of the colony of Gheel has been so remarkable that other countries have been influenced to adopt a like system or another system of lamily care deemed better adapted to local conditions

A second colony for family care of mental patients was established in 1884 at Lierneux, a village in southeastern Belgium. This colony, which was patterned after the Gheel colony, has not attained large size but is giving excellent care of the Walloon patients to whom it numsters. In 1936, the colony was caring for 618 patients, half of which were in the infirmary, and half in families in the village and

surrounding country

Family Care in Scotland.-In Scotland. a supervised system of family care of mental patients was authorized by an act (25 Aug 1857) regulating the care and treatment of lunaties. From that time to 1913, there was an irregular increase in the number of boardedout cases, the number in that year reaching 2,909. During the years of the World War of 1914-18, there was a decline in the number of mentally ill patients cared for in families, and such decline has continued at a slow rate. On the other hand, the number of mental defectives placed in families has markedly increased. On 1 Jan 1939 the number of so called lunatics cared for in private dwellings in Scotland was 1,087. The same date shows that the number of mental detectives cared for in families was 1,584

Although all certified pauper patients in Scotland are under the supervision of the General Board of Control, asylum treatment is practically separate from family care. Many of the patients in family care never see an asylum, and the asylum superintendent does not know of their existence. A superintendent may recommend some of his patients for family care, but after they are placed in family homes, his

authority over them ceases,

The administration of the boarding-out system was formerly vested in parish councils, of which there were 875. In 1929, a new local government act was passed. This act, 15 May 1930, transferred to county councils and to town councils of large burghs the duties formerly exercised by district boards of control and by parish councils under the Lunacy and Mental Deficiency acts Accordingly, county councils or town councils select the guardians and homes that are to receive patients.

Standards of care and administration, and tules pertaining thereto, are established by the General Board of Control, but the placing and oversight of patients devolves on the local officials. Moreover, the inspection by local officials is supplemented by visits of deputy commissioners representing the board.

As the success of family care depends fully as much on the guardians as on the patients the former are chosen with great care. They must be substantial, intelligent householders of good character and habits. Their family life must be wholesome, and all adult members must have a friendly attitude toward the pa tient when received in the home.

A guardian must have a dwelling large enough to furnish comfortable quarters for the number of patients assigned him. There mus-

be adequate provision for heating, ventilation and light, and the customary home comforts In addition, the guardian must provide suitable exercise, occupation, and diversion for the patients in his care. A guardian can care for but one patient unless specially licensed by the board to receive more. The maximum number permitted to a dwelling is four, the numbers most commonly found are one and two

The cost of caring for pauper lunatics in

private dwellings during the fiscal year ended 15 May 1938, averaged 13s 7d per week per patient as compared with 23s 8d. in Royal asylums, 21s in district asylums, and 18s. 5d.

in lunatic wards of poorhouses
Family Care in France.—The outstanding achievements of the family-care colony at Gheel attracted the attention of the Council General of the Department of the Seine in France which, in 1890, was seeking ways to reduce the overcrowding in the asylums of the department. Representatives of the council in that year visited the Gheel and Lierneux colomes in Belgium and inspected the familycare system of Scotland. In the session of 1891, the council decided to establish a familycare colony for women patients above the age of 50 After careful investigation, the city of Dun-sur-Auron in the Department of Cher was chosen as the site of the new colony. The people of the town heartly welcomed the project, and on 17 Dec 1892 the colony was opened with Dr. August Marie as director. By the end of 1893, 108 patients had been transferred from the mental hospitals of the Seine to the new colony. Each year thereafter showed an increase until in December 1903, the number of patients in the colony reached 900. Since that time there has been an irregular upward trend On 1 Jan 1936, the number was 1,323 In 1939, it mounted to about 1,500. As the colony became larger, it was necessary to make placements in the villages surrounding Dun. On the above date, there were 679 patients in families in Dun, 89 in the colony center, 550 in families in eight nearby towns, and five on leave. The largest number of patients in any of the villages outside of Dun was 122, at Ourouer

The development of the colony center has kept pace with the increase of patients At first it consisted of small quarters which housed the administrative personnel, and an infirmary (D) with eight beds Baths for patients were installed in the municipal washbatters were instanted in the intincipal wash-house. In 1897, a small pharmacy was in-stalled; in 1898, Infirmary R with 16 beds was built; in 1899, Infirmary D was enlarged to accommodate 12; and in 1900, Pavilion Henri Le Roux was begun. This building, which was opened in 1902, was designed to care for about 70 patients. It was necessary to have such a ward for patients awaiting family placement and for patients returned by families. Other additions to the center, installed at various times, included an autopsy room, a laundry, a

bathhouse, and an assembly hall.

The employed personnel of the colony in the beginning consisted of the medical director, a clerk, and two nurses. These proved sufficient to handle a patient population of 213 The medical and nursing personnel in 1936 comprised a medical director, a head physician, three medical assistants, eight visitors, two inspectors, two solicitors, and 16 nurses, a total of 33. The administrative personnel comprised, in addition to the medical director, nine clerical employes, two laundry employes, two gardeners, a coachman, a cook, a porter, an electrician, and a chauffeur

The colony at Dun was established primarily for women patients above the age of 50 The age limit was later reduced. A few men are received from the hospitals of the Seine to help in the heavier work connected with the maintenance of the colony center and the cultivation of the received control of the colony center and the cultivation of the received control of the colony center and the cultivation of the received control of the colony center and the cultivation of the cultivation of the cult vation of the gaidens On 1 Jan 1936, there

were 22 men patients on the colony rolls

The colony receives both psychotic and mentally defective patients, and apparently makes no distinction between these classes when placing patients. Of the 152 admissions of 1935, 62 were classed as mentally defective and 90 as psychotic Nearly all groups of mental disorders were represented. Care is taken to place patients in families where they will be liappy and will receive the maximum benefit

from their new life.

The colony center maintains close supervision over the patients in family care. «Free life with active and continuous medical supervision» is the governing principle in the management of the colony Patients living in families are as free as members of the family. Houses are usually locked at night, but during the day patients may stroll at will through the streets and parks of the city. They may also go shopping or visiting. Of course, they are required to be home at mealtime and bedtime.

The maintenance cost of patients at Dun, including compensation to guardians, sion, transportation, administration, and care of patients at the colony center, was about 40 cents a day in 1935. The average daily cost of maintenance in the mental hospitals of the Seine in the same year was about \$1. Moreover, the annual per capita investment charge was much greater in the latter institutions. The guardians in Dun receive about 30 cents per day for the care of each patient. That this amount is deemed sufficient is indicated by the fact that the colony has a waiting list of 200 families who are ready to care for patients.

At Amay-le-Chateau a similar family-care colony, designed to care for men patients only, was established in 1900 The colony replaced an annex of Dun, which accommodated 30

patients at the time

Family Care in Germany.—Family care in Germany originated and developed as an adjunct of an institution As early as 1764, Dr. Engelken, a former army physician from Holland, placed patients from his small private hospital in Rockwinkel, near Bremen, in families in Ellen and other farming communities in the vicinity of the hospital. At first the placements were made without careful selection of patients and guardians, and the care given patients was not well supervised. Family care, so inadequately begun, has continued in that region down to the present time. In the latter half of the 19th century, 15 German institu-tions introduced family care. These were fol-lowed by 45 others from 1901 to 1914 From 1914 to 1936, war, inflation, poverty, and 1914 to 1936, war, inflation, poverty, and changes in government seriously interfered with the progressive development of family care. On the other hand, the lack of funds for the building of new hospitals has necessitated home or family care for many mental patients

One of the most successful of the early German experiments in family care was that made by Ferdmand Wahrendorff, director of a private institution for mental cases at liten in the province of Hanover. This highly esteemed physician instituted a well-planned system of family care in connection with his institution in 1880. Beginning with four patients in three families, the system grew rapidly, until at the death of Dr. Wahrendorff in 1808, it comprised 140 patients who were living in congenial homes in neighboring villages. So powerful was the influence of Wahrendorff and so far-reaching were the effects of his experiment that he has been named «The Father of Family Care in Germany»

Konrad Alt, after securing reports from all the mental hospitals in Germany, reported that there were 1,200 patients in family care in that country in 1902. A later canvass showed that the number had increased to 2,400 in 1906. From that day down to 1915, there was a gradual increase of patients in family care in Germany. The number in that year reached 3,815. A decline in family-care cases, which began in 1916, reached its low point in 1921 when there were only 1,511 patients so cared for An upward trend in family-care cases, which commenced in 1925, continued to the opening of the second European war in 1939. The latest available figures (1932) show a total of 5,063 patients in family care.

The development of family care has proceeded unevenly in the several German states. Prussia exceeds all other states in the extent of use of family care, having fully nine-tenths of the total family-care cases in Germany.

of the total family-care cases in Germany.

Along with the development of family care in Germany there has been evolved a system which cares for patients in their own families under the supervision and care of the physicians and nurses of a neighboring hospital.

Family Care in Switzerland.—Family care

of mental patients in Switzerland was begun in 1901. The first placements of patients in famihes were made in the canton of Beine. The experiment proving successful, other cantons introduced family care in the following order: Vaud in 1904; Schaffhausen in 1907; Zurich in 1909; Solothurn in 1925; Aargan and Basel-Stadt in 1929; St. Gallen in 1931; and Valus in 1934. Although the other cantons do not have official systems of family care, many of their patients each year voluntarily welcome such care. Placement of patients in families in all cantons that have organized systems is governed by special regulations. In most cases the patient is first admitted to a mental hospital and is under observation and treatment for a time before his placement in a family is considered. If eventually deemed eligible for placement, a suitable home is found for him. While in such a home, he remains a patient of the hospital and can be returned to it whenever conditions render it advisable. In the canton of Zürich certain mental patients are placed directly in families by the official inspector for family care. In several cantons, colonies which serve as intermediate stations between the institutions and family care have been established. tions and family care have been established. These colonies are managed by nurses or attendants in the employ of the cantonal institu-

tions. The colonies vary in size, accommodating between 12 and 30 patients.

In the canton of Zurich a special organization known as the "institution des Inspektorates fur Familieripflege" was set up in 1909 to manage and supervise the placement of patients in families. The head of this organization is a physician on the staff of the well-known hospital, Burgholzh, at Zurich. The inspector decides what families are cligible to receive patients and what patients may be placed in families. He supervises the assignment of patients, and their transfer and return when necessary. He also has charge of the financial arrangements connected with family care. In this canton, there were 407 mental patients in family care on 1 Jan 1939. The annual placement in families in the entire country is about 400 per year.

Family Care in Hungary.—Family care of mental patients was begin in Hungary in 1905, At that time the institutions for mental patients were greatly overcrowded, and funds were not available for the construction of ad-ditional hospitals. The first family-care colony in Hungary was modeled in accordance with the Gheel plan and was established at Dicsoszentmarton. Later, other family care colonies were established. These were closely affiliated with institutions in accordance with the amer plan Care of patients in families proved popular and the colonies rapidly developed. At the time of the outbreak of the World Worse. War in 1911, there were about 1,800 patients in family care. These constituted 17 per cent of the mental patients committed to public institutions. During the war the colonies rapidly declined. They further suffered by the demoralized condition of the country after the close of the war. Some of the colonies were entirely abandoned and others had but few The total number of patients in patients family care in 1923 was reported as 114. With improved economic conditions which followed money stabilization, the family-care colones again grew, and additional colones were formed in connection with state institutions. By January 1930, the patients in family-care colonies had increased to 2,267, which comprised 26.1 per cent of all patients committed to mental hospitals.

Family Care in the United States.—Family care of mental patients in the United States had its beginning in Massachusetts in 1885. In that year a law was enacted authorizing the State Board of Health, Lumacy and Charity to place in suitable families insune persons of the chronic, quiet class; the rate to be paid for the patients so placed was not to exceed that paid in the state lunatic hospitals. State patients in foster families were to be visited by agents of the board once in three months, and town and city patients in such families, once in six months. Pursuant to this act, the first patients were placed in families on 10 Aug. 1885. At the end of that year, 29 patients were in family care. Thereafter, the number gradually increased and reached 256 in 1905. A noteworthy change occurred in that year due to the enactment of a state law extending authority for placement to the state hospitals. In 1915, the board discontinued its own selection and placement of patients and transferred many of its family-care patients to

state hospital supervision. In response to the new legislation the number of patients in family care rose to 403 by the end of 1905. Since that time the number has varied from year to year, being 317 in 1938. Eleven Massachusetts state hospitals reported patients in family care at the end of that year. Of these, Gardner and Worcester state hospitals were using family care

most extensively

Notwithstanding the successful experience of Massachusetts, other states were slow to adopt family care to supplement institution care. In New York State, mentally detective patients were first placed in family care by Newark State School in September 1931. The patients so placed were children that were capable of attending public school. In January 1933, the same institution began the formation of a family-care colony at Walworth, N Y Success having at-tended these efforts, other state institutions became interested, and the state legislature in its 1935 sessions made provision in the Appropriation Bill for the allocation of a sum not to exceed \$20,000 from the maintenance fund of each institution in the State Department of Mental Hygiene for the purpose of establishing a system of family care for patients at rates not exceeding \$4 per week. During the year that followed, over 400 patients were placed in foster families by state hospitals and state schools. The rate allowed for board was later changed to a maximum of \$6 per week. By 1938 the number of patients in family care reached nearly 900. There was a decline in 1939 due to insufficient appropriations, but in 1940 the number of cases in family care was restored to its former level.

Nine other states, profiting by the pioneer work of Massachusetts and New York, have adopted family care for a portion of their mental patients. Altogether there were about 1,600 mentally ill and 900 mentally defective patients in family care in the United States in 1940. It is now generally recommend that such 1940. It is now generally recognized that such care is beneficial to both patients and foster families, while constituting a substantial economy for the state.

Cost of Family Care.—In general, family care has been found to cost about one half as much as institution care. The amount paid to families for the board and care of patients varies widely in different states and countries. In New York State, the rate is from \$4 to \$6 per week per patient; in Massachusetts, \$4.50 per week. In most foreign countries a lower rate is paid. The equivalent of 25 to 40 cents per day per patient is the usual compensation to families in European countries. As the amount paid families is generally considerably less than the cost of maintenance of patients in institutions, exclusive of housing, and as the state or country is relieved of the necessity of providing beds for family-care patients, the saving resulting from family care becomes an important item.

Advantages of Family Care.—The advantages derived from family care are fourfold: Patients placed in suitable families resume a measure of community life with a natural environment and with more freedom than could be possible in a state hospital. The families receiving patients have an outlet for their altruistic sentiments and acquire a secure economic status. The state hospital, relieved of many of its custodial cases, can devote more of its energies to the scientific treatment of acute and recoverable patients. The state, conducting an extensive system of family care, is relieved of the necessity of building new hos-Intals and has a better opportunity to treat its mental patients in accordance with their individual needs

vidual needs
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MENTAL PROCESS. A term used in psychology to denote the phenomena of mind viewed as changing rather than as timeless substances. One of the great changes which has come over philosophy in the past century or so is the obsolescence of the notion of substance. It is realized more and more that the unity of phenomena is to be explained, not by the fixity and homogeneity of a stuff behind them (see l'Anysychism), but as the persistence of a certain type of change or process. Just as the physicist has ceased to worry much about the nature of matter or the ether and has given himself wholeheartedly over to the study of their laws of change, the psychologist has come to see the utter barrenness of the substantial conception of mind, and now interprets the mind and all phenomena pertaining to it under the category of process. The mind itself is often treated as the stream of its states, while these are no longer regarded as instantaneous, unese are no longer regarded as instantaneous, but rather as undergoing a temporal waxing and waning of their own. Consult James W., Principles of Psychology (New York 1890); Stout, G. F., Analytic Psychology (London 1896); Titchener, G. B., Textbook of Psychology (New York 1910); Wundt, W., Grundzüge der physiologischen Psychologie 6th ed. (Leipzug 1008-11) zig 1908-11).

MENTAL SCIENCE, the science of mind; (a) properly, a synonymous term for psychology, or that branch of metaphysics which treats of the aggregate of knowledge concerning the mind and mental operations. (See Psychology; INDUIDUAL PSYCHOLOGY; SOCIAL PSYCHOLOGY; and related references). (b) A term also applied to various empirical systems of religious and philosophical thought, which propound the doctrine that most physical ailments are curable by faith, or rational exertion of the mind, without the aid of medicine out the aid of medicine.

Historical Back-MENTAL TESTS. ground.-Modern psychology has been aptly characterized as an experimental science, and its preoccupation has been with the typical human being. There were trends, however, as early as the 1880's, that bore in the direction of emphasizing individual differences. One was the clinical study of abnormal personalities, and eventually some of the hospital psychiatrists turned to the psychologists and their laboratory instrumentation for many of their methods of examination.

Meanwhile, out of the laboratory experiment the mental test developed; for once experimentation had furnished a set of findings drawn up as laws about people in general, then the individual man could be examined and compared with manin-general. When an experimental technique was used to determine a given person's particular ability or trait, it became not a psychological experiment, but a mental test. At first, the traits tested were mainly reaction time, sensory keenness and sensory discrimination; memory abilities, motor accuracy, steadness, and speed; imagination; word-association, and attention

At the beginning of the 20th century attempts had been made at combining tests such as these and others to see which combinations might be fruitfully used At Columbia University, J. McKeen Cattell was applying a battery consisting of a wide variety of laboratory-derived tests to the entering freshman and again to the graduating seniors, to see what changes due to age or to college environment might be brought

to light.

Tests of General Intelligence.—Progress in the measuring of special aspects of psychological equipment became overshadowed by one achievement in particular. This was the successful combining and scaling of different tests to form a measuring rod for general intelligence. In 1905, 1908, and 1911, Alfred Binet (1857–1911) and Théodore Simon (1873–) devised a method, which would be more valid and more time-saving than were the teachers' judgments, for identifying those children in the schools of Paris that should have special attention. Their scale consisted essentially of series of problems and questions, to answer which demanded the exercise of "general intelligence." They were designed not as a test of the child's knowledge derived from school or home training, but as a test of his native capacity to acquire such knowledge. The child might be asked to follow out simple commands, to draw copies of complicated designs, to combine disarranged words into a sentence, to name some objects shown to him, or to tell what he would do in certain everyday situations described by the examiner. The tests were so graded that the easiest lay well within the range of the ability of the average 3-yearold, while the hardest taxed the ability of average adults. The scaling of these tests was done empirically, i.e., was based upon found results with Parisian children of all ages. For example, if, when tried, a given test was successfully passed by two-thirds to three-fourths of the 9-year-olds, but by a much smaller ratio of the 8-year-olds and a still smaller ratio of the 7-yearolds, it was then set up as a suitable test for "9-year-old intelligence." The tests accepted as best differentiating ability of the average 8-year-old were placed together, those for the average 9-year-old were placed together, and so on until for most age-years, a set of five tests was available; the whole series were finally combined into

one scale, from age 3 to age 15 and to adult. By such a measuring rod it became possible to find out whether a given child tested was "at age," i.e., normal, or was retarded or superior.

The practical value of the Binet tests was

The practical value of the Binet tests was not long in becoming, recognized outside France. In America clinical psychologists were prompt in setting about the task of revising Binet's particular tests to the language and experience-background of the average American child, and of improving the scale and the procedures of administering and scoring. The scale most employed today is that constructed by Lewis M. Terman and Maud A. Merrill, which is the 1937 revision of the "Stanford Binet" examination. They adopted from Wilhelm Stern the method of indicating the relative brightness of a child by his "intelligence quotient" or "IQ," found by dividing his "mental ane" by his "chronological age." If a subject's IQ is atound 100 per cent, then he has tested as somewhere near the average of children of his chronological age.—he is of normal intelligence. It his IQ is 75, he has been found able to pass tests only of much younger ages than his and he is classed as mentally subnormal, or perhaps, techeninded.

Interest in intelligence testing has inspired a truly enormous amount of work. Most of this work has been based upon the use of tests as well accepted measures to determine what relationships may be found between intelligence and some other variable such as age, nationality, blood kinship, home status, occupation, and innumerable others. A tew of the researches have been in the direction of critical inquiries into the nature of intelligence itself. Buiet, and most others who have adopted his scale, have assumed that what the tests purport to measure is largely a native trait, intrinsic to the individual person. The point is reflected in the notion that the IQ of the same individual remains very closely the same throughout childhood. Thus, a boy at 5 years who tests 6 years in mental age, and so has an IQ of 6/5 or 120, will, when 15 years old, continue to have an IQ of 120, and will be mentally as bright as 18 year olds. Obviously, this predictive function of the IQ has tremendons importance. There is a controversy, however, between those investigators who claim to have demonstrated that a child's IQ can be raised many points by furnishing him a stimulating environment and careful teaching in early years, and those who insist that such claims

greatly exaggerate the possibilities.

Certain limitations in the Bunet method of examining for intelligence have been recognized, and have led to the development of supplementary tests. (1) It cannot be as successfully employed with adults as with children. This arises from the fact that Binet originally standardized his tests only up to and through the age of 15 years; and the Stanford-Binet of 1937, though adding three more levels of brightness, still assumes 15 years as the "average adult" level. Then, too, the very content of many of the test items is umbkely to cheit the desired interest on the part of adults. Also many of the tests put a premium on the speed factor, whereas the slowing down in mental operations in later maturity has been found to be at no cost in accuracy. For the examining of adults on the other hand there are the Wechsler-Bellevine Intelligence Scales or the Army Individual Test. With these scales the final score of brightness is not cal-

culated from mental age values of tests passed, but from the total number of points made on all tests, this total being then restated as a distance (in "standard deviations") above or below the average score made by adults of all ages. These have two advantages. The component tests fall into two general sorts: the verbal test and the performance test, which makes it possible to compare an examinee's facility in using words and symbols with his ability to manipulate objects and to perceive designs. Furthermore, the patterns of high and low scores on the respective component tests of the Bellevie scale vary characteristically with certain psychiatric groups (as the schizophrenic, the neurotic, the defective), so that not only brightness-level but clinical type

of deviate can be recognized

(2) The Buiet type of test depends in part upon the examinee's ability to use language, oral and written, yet there are classes of people, whom it may be desirable to examine, who are illiterate or deal, or who are untamiliar with the English language. The oldest and best-known of the performance tests is the form board type, consisting of a baseboard bearing holes of varying shapes into which the examinee is instructed -by wordless hand motions if need be--to fit the appropriate blocks from among those supplied him. The picture assembling test is much like the popular jigsaw puzzle, with pictured objects of events which require some understanding and interpreting of them in order to completely assemble them. There is the block design test in which the examinee is shown a colored pattern and is instructed to copy this by putting together cubes with different colored faces and half-faces Quite different is the cube imitation test four cubes are set in a row before the subject, then the examiner taps them with a fifth cube in some standardized irregular order, and the subject is bidden to do likewise.

(3) The Binet method of intelligence measurement cannot be employed to test more than one individual at a time. This has led to the

develop of group intelligence tests

Group Tests.—The initial sputt of interest in group tests was occasioned by the recognition of their practical value, when the United States entered the First World War, in sorting out army recruits of varying levels of intelligence for promotion, discharge, special training, and other differential assignments. These men were drafted in such numbers that testing them individually proved unfeasible. In a group test the examinees are provided with printed booklets containing a variety of tests, each usually printed on a separate page and so arranged that it can not be seen in advance of or after the time during which work is to be done on it. The examiner uses a series of signals by which all examinees' starting and stopping of tests is controlled in concert. Each test is a series of questions or other items calling for penciled answers.

Just as in individual examining so in group examining there was seen to be a need for tests of nonlanguage or performance types. To meet this need there were developed printed problems that utilized designs rather than words Since the First World War there has been a heavy output of group intelligence tests of both language and performance nature, including the Army General Classification Test employed in the

Second World War.

Results of Intelligence Testing—Just as the origin of intelligence tests lay in practical school demands, so their widest usefulness has been in connection with educational problems. For one thing, they have been quite widely employed to differentiate the children in school classes into the superior, average, and inferior sections; and over a wide area the differential treatment of the sectionized grades has obtained gratifying results. It should be pointed out that in dealing with the individual child, administrators recognize many factors other than native intelligence as contributing to his school success, such as health, home environment, and industry Intelligence tests do not measure ability in all school subjects equally well; their results have been found to correlate better with grades made in composition, reading, and arithmetic, e.g., rather than with grades made in handwriting, handwork, drawing—or even spelling

Group tests of the intelligence test type—though not so labeled—have been in well-nigh universal use in the induction of college freshmen, furnishing data for later reference in cases

of disciplinary action or of counseling

The greatest use of tests of intelligence, after educational and after military needs, is in vocational guidance. It is assumed that insofar as the different occupations and trades demand of people successfully pursuing them, different ranges of level of intelligence, then to learn the level of a given young man or woman is very material to guiding him successfully. This has been borne out in a very general way However, success in a given occupation obviously depends upon so many other factors—interests, special aptitudes, personality makeup, and others—that the tests of general intelligence may be said to have more of an eliminative than a positive selective value.

Achievement Tests.—The impression made on psychologists and educators by the successes of the intelligence test movement led rapidly to the adoption of similar objective methods for measuring other abilities and traits. The impact upon school subject examinations was shown by the adoption of various test forms that freed their scoring from the influence of subjective impressions on the examiner's part. They included the answer of "true" or "false"; underscoring the correct answer out of alternatives; filling in a blank space with the correct word, or matching the relevant items in two arrays. These achievement tests are used to measure what level of facility or range of information the examinee has achieved in some particular area, as algebra, Italian, economics, or a nonacademic subject.

Aptitude Tests.—Another direction taken in

Aptitude Tests.—Another direction taken in the widening application of objective testing methods has been in the measuring of characteristics of a person that predict his ability to acquire, with training, some particular skill or knowledge. A celebrated battery of aptitude tests is that for musical talents devised by Carl E. Seashore. He has shown that "ability in music" really involves many components in a complex hierarchy, and for most of these he provided specific testing procedures. Phonograph disks are used to produce the sounds used in testing ability to discriminate differences in pitch, intensity, time interval, timbre, melody, and rhythm. The scores derived from these and other tests are then represented graphically as distances from a zero line, the resulting "profile" presenting a

kind of picture of the examinee's various mustcal talents. Musical tests have been widely employed to direct attention to pupils who have unsuspected abilities calling for musical trainmg, and they have also shown that in others musical training is an unwise investment. Other tests of music furnish vocabulary and question

tests to measure musical knowledge

Aptitude for art training has been tested in a variety of ways. One is by showing pairs of uncolored pictures or sets of four designs, the examinee to indicate his preference in each case, and then comparing these judgments with those previously obtained from art authorities. Many other art apintudes, such as color preference, have been subjected to measurement

Aptitude testing has shown much advance ment in examining capacity for mechanical training. Some tests put a premium on the subject's ability to "get the hang" of a mechanical device, by asking him to assemble correctly into a work mg unit the separated parts of a bicycle bell, of a monkey wrench, of an electric light socket, or some such device. Other tests are directed at manual dexterities, as those involved in handling a complicated form board or stacking together some "wiggly" blocks. Then there are paperand-pencil tasks, such as the kind that asks which pictured tool (screw driver, wrench) is used with each pictured object (a nut, a bit), or the kind that demands the quick putting of dots into small circles, or that involves counting how many blocks touch other blocks in a pretured pile of them.

Tests of other vocational aptitudes have been, and are being, developed. Tests of *elerical* aptitudes usually consist of operations not essentially different from those called for on the paper-andpencil group intelligence tests; but they are directed to details that are especially relevant to the work of a business office, such as checking

numbers or matching names

The interest in vocational counseling, as well as the need which has been felt for sitting applicants for admission to the professional schools, have supported attempts to apply principles of aptitude measuring to the learned professions. The validation of these principles has been measused by comparing the scores of such applicants with the grades later made by the examinees in the professional school studies rather than with the degrees of success achieved still later in professional practice; and the value of these tests has been limited on the whole to selecting the persons who will do well in the professional

fields in question.

In medical aptitude tests, the traits covered vary considerably; but taken together, they include tests of such things as knowledge of scientific facts, visual imagery, logical reasoning. Medical schools are using these tests to some extent for active selecting of candidates, but they are also maintaining a research attitude toward the question of their ultimate validity. There has not been as widespread acceptance of aptitude tests for admission to law schools as for admission to medical schools. For the study of engineering, aptitude tests have been devised ever since the end of the First World War; but there has not been persistent interest in comparing, validating, and standardizing the manifold available tests on a nationwide scale Mathematical ability seems to be the most adequate single measure upon which ability to do the work of

the engineering schools can be predicted, with facility in spatial thinking running second,

Interest Tests Success in an occupation certainly depends upon more than one's native ability developed by training, it depends upon his interests in many different directions. Consequently, aptitude tests frequently are supplemented by interest inventories. The examinee may be furnished elaborate lists of items concerning annisements, school subjects, people's peculiarities, personal possessions, and the like, and he is to indicate for each item whether he likes, dishikes, or is indifferent to it. The results are then studied to see whether or not the pat-tern of the examines's likes dislikes resembles that previously obtained from successful enomeets, or life insurance salesmen, or other vo-cational groups. Where there is high correspondence, it is to be concluded that—capacity and training granted there is evidence that the examinee would be happy in that occupation.

Personality Tests—The great contemporary

interest in problems of the total personality has led naturally to the development of approaches to the measuring of personality. But that word has many meanings; the approaches therefore

are diverse.

The questionnaire incentory method, developed during the First World War by Robert Sessions Woodworth (qx), has been adopted in invitad forms. It sentrally this is not a test in which the subject actually faces a problem or situation, but a test which consists of a list of questions which the subject answers in the first person; e.g., "Are you easily moved to tears?" "Are you fouch on various subjects?" "Are you slow in making decisions?" In a four much in use, R. G. Bernreuter has picked 125 questions from many of the more successful inventories and recombined them. By applying different scoung keys which assign different weights to the various answers, the subject can be scored on six personality traits, neurotic tendency, sell sufficiency, introversion-extroversion, dominance-submission, self-confidence, and sociability. It can be seen readily that in the adop-tion of such self questioning methods, whatever their internal consistency, their validation (the faithfulness with which they do measure what they purport to measure) must be a persistent problem.

Other scales in much use, especially by industrial concerns, assume certain "components" of the personality for which the tests may be scored hysteroid, cycloid, schizoid, epileptoid, hypochondriacal, masculine feminine, and others. Such terms come from the psychiatric hospital, and this use here recognizes that the deviations and eccentricities of mental illnesses are after all only exaggerations of variations to be found

among the normal

In clear contrast with the personality tests which limit the subject's responses to previously drawn-up alternatives and which consist of many discrete items, is the projection type of personality test. Therein the subject is free to react as he pleases and this yields insight into his desites, plantasies, emotionality, dominant interests. The Swiss psychologist, Hermann Roischach, seized upon the familiar ink-blot exercise as a way of revealing the profounder characteristics of a patient in his way of seeing or apprehending the blots. Standardized printed blots are presented one at a time to the individual for his

oral responses. (In a form adapted to groups, the blots are thrown upon a screen and the examinees write out their responses.) Does the examinee see things as a whole, or does he emphasize the details? Is he influenced more by form, by movement sensations, or by coloring? Does he tend to see human beings, animals, plants, or landscapes? Are his responses individual with him, or much like those of other people? This may look like a piccemeal, itemby-item, analytic sort of approach. It is far from that All the tabulated details are arranged so that the skillful clinician can inspect them, not by adding and subtracting, but by apprehending them as a whole It is not unlike the way one looks at a picture, and it should lead the clinician to a true picture of his examinee as a total personality his expressiveness, interests, talents, temperament, and even his philosophy of life The idea is not untanuliar in daily life; one often speaks of knowing his triend—not as a series of itemized details but as an indivisible unique personality. The claims of those who use and adapt the Rorschach method are broad and ambitious, nevertheless it is growing in favor and in use.

A newer projective technique, the "thematic appeticiption" test, employs a series of pictures, each depicting an ambiguous dramatic human event. The examinee is instructed to build up some fictional story illustrated by the picture, with preceding and subsequent events. In doing so he may be expected to read into the material some of his own personal problems and inderlying strivings, the stories when taken together revealing a unitying thema. As is obvious, insight and judgment is demanded of any examiner

employing this technique

Among the most important things in the organization of a man's personality are his value attitudes. The esthete, the man-about-town, the sanctinomous, the money mad, furnish cases of special channeling of interests into specific areas. A method for determining the relative strengths of these different value-species within an individual consists of questions on specific problems or situations, the answers to which will reveal the examinee's appreciations to be more weighted by theoretic, economic, social, political, religious, or esthetic considerations.

In General -- The foregoing account is of necessity selective. Of the hundreds of mental tests in actual use, only some examples of the more distinct kinds could be mentioned.

Not has space permitted adequate mention of the manifold applications of mental tests to education, to vocations, to military service, to hospitals, and to social-welfare work in general

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MENTCHIKOF, or MENSHIKOV, Alexander Danilovich, Russian soldier and statesman b. Moscow, Nov 6, 1672, d Berezov, Siberia, between November 1729 and February 1730. He was of obscure parentage, but successful and the state of the st cceded in entering the service of Prince Lefort, the favorite of Peter the Great, later discovering and thwaiting a conspiracy against his patron's life After serving in the campaign of Azov, he accompanied the Czar on his trip through Holland and England, and on the death of Lefort became his chief adviser. He was created field marshal and prince by Peter, and prince of the German Empire by Leopold I, and during the absences of the Czar acted as regent. During the campaign of 1706 he defeated the Swedes at Kalish, and in 1709 was largely instrumental in securing the victory over Charles XII at Pultowa in 1710, as commander of the Russian forces in the north, he took Riga, occupied Pomerania and Holstein, and conquered Stettin. His arbitrary acts, however, finally resulted in his count-martial by Peter, though the death sentence was commuted to fine. He was one of the principal factors in the accession of Catharine I to the throne (1725–27), and till her death was all-powerful, and even after Peter II succeeded to the throne he had absolute control of the goveinment He was about to marry his daughter to the young Czar when he was suddenly over-thrown by Vasah Lukich Dolgoruki (1670-1739) and exiled to Siberia by Peter II in September 1927 His great-grandson, PRINCE ALEXANDER SFRGEFVICH MENSIHKOV, b. Sept. 11, 1787; d. May 2, 1869, took a prominent part in the campaigns against Napoleon (1812-15) and the Turks (1828-1829). He was governor general of Finland in 1831 and in 1854-55 he commanded the Russian naval and military forces in the Crimea. He is noted for his conduct of operations in defense of Sevastopol.

MENTHACEAE, sometimes known as Labbiatae, a family of dicotyledonous herbs or shrubs distributed mainly in temperate climates. The species, of which there are more than 3,000 grouped in about 150 genera, are characterized by four-cornered stems; opposite, exstipulate leaves; mostly two-lipped flowers generally in whoils, cymes or heads; and one to four achenes in a persistent calyx. They are noted for their volatile oils, which in many instances are of economic importance either as perfumes or as flavorings. Some species are cultivated for ornament, but probably the best known are those which have been used for centuries for flavoring food, such as sage, thyme, savory, marjoram, mint, balm and basil (qq v.). The kinds used most frequently in perfumery are probably lavender, rosemary and patchouli. One species, variously known as Chinese or Japanese artichoke, chorogi and knotroot, Stachys sieboldi, yields edible tubers which are eaten raw or cooked in Asia, France, and to a small extent in the United States Many labiates have at some time been reputed medicinal but are now rarely used except to disguise

the taste of disagreeably flavored drugs. best-known genera represented in the United States are Nepeta (catinp), Mentha (mint), Origanum (maijoram), Salvia (sage), Thymus (thyme), Mariubium (horehound), Satureia (savory), Lavandula (lavender), Monarda (horsemint), Ocimum (basil), Melissa (balm), Scutellana (skullcap), Lamum (dead nettle), Calamintha (calaminth), Teucrum (geimander), and Trichostema (blue cuils)

MENTHENE. See MEIHANE MENTHOL, peppermint camphor, C10H19OH,

∕CII₂CII。∖ CH CH (CH₃)₂, CH₃ CH or XCH₂ CHOH/

is the chief solid constituent of the Japanese and Chinese peppermint oil (from Mentha piperita Linne, of Mentha Arvensis) American and English oils contain menthol in much smaller quantities, and the menthol obtained from these sources is said to differ from Chinese or Japanese menthol in its crystalline structure

The commercial product is chiefly obtained from the Japanese oil of peppermint, which sometimes contains from 70 to 90 per cent of menthol. For the extraction of menthol the oil is cooled to a very low temperature, when prismatic crystals separate out. The yield is considerably increased by subjecting the peppermint oil to fractional distillation and then cooling the residue. A number of substances are -sometimes used to adulterate the commercial product; among these may be mentioned hydrated magnesium sulphate, paraffin, wax, thymol and various morganic compounds pure substance should possess a sharp melting point and should completely volatilize when heated on a water-hath in an open vessel Menthol separates in long prismatic crystals. It melts at 43° C, and boils at 212° C. The crystals possess a strong peppermint odor and a cooling taste. It dissolves readily in alcohol, ether, chloroform, carbon bisulphide, strong acetic acid and m a number of oils. Its solubility in water is very slight but the water solution possesses the odor and taste of the substance

The molecule of menthol contains three asymmetric carbon atoms, and a number of stereo-isomerides are possible; the commercial product consists mainly of the laevo modification. Menthol exhibits the properties of a saturated secondary alcohol. Careful oxidation with chromium trioxide converts it into the corresponding ketone, menthone. With acids it yields esters. With phosphorus pentachloride it forms menthyl chloride. Heated with phosphoric anhydride or zinc chloride it forms menthene, C₁₀H₁₈. With copper sulphate it yields cymene, and with hydriodic acid, in the presence of phosphorus it forms havehydroumane. of phosphorus, it forms hexahydrocymene

Menthol acts as a mild local anæsthetic the form of cones or in solution in various solvents it has been used as a remedy for neuralgic headache, toothache, catarrh of the nose, asthma, diphtheria, diarrhœa, sciatica and tuberculosis of the bone. Sometimes it is also employed as the chief ingredient in atomizers, inhalers, toothpastes, ointments, liniments, and in a number of preparations for internal use. V. S. Babasinian

Professor of Chemistry, Lehigh University.

MENTONE, měn-tô'ně (Fr Menton, môntôn), France, a scaport town and health resort on the Mediterranean, in the department of Alpes-Mattimes, near the Italian frontier, and 15 miles northeast of Nice. It is charmingly situated on a promontory about the middle of a bay five miles in circuit, encureled by abruptly rising hills. The ancient walls of the feudal town are still standing, and there the streets are dark and crooked. The new part of the town, with numerous fine villas, stretches along the base of the hill on which the old part is situated, parallel to the sea. The climate of Mentone is mild and equable, it is rare that the thermometer descends as low as the freezing point, or uses higher than 80' F, hence making Mentone a tayoute resort for persons in deli-cate health. There is a considerable trade in fruit, in flowers and leaves used in the manufacture of pertumes, and in olive-oil. The town of Mentone belonged to the principality of Monaco from 1340 to 1800, but in the latter year was ceded to France. In the vicinity, but on Italian territory, are the grottoes of Baoussé Rousse, popularly known as the Caves of Mentone, famous for the valuable evidences of prehistoric man that they have yielded. Pop. (of commune) 18,000.

MENTOR, according to Greek legend, the faithful friend of Ulysses, who entrusted to him the care of his domestic affairs during his absence in the war against Troy. The education of the young Telemachus fell to his charge, and when the latter set out on his voyage in search of his father Minerva accompanied him under the form of Mentor (Odyssey, ii, 390; iii, 12, etc), acting the part of a prudent and experienced counsellor to the young hero. This character of a sage adviser is more fully developed in the Télémaque of Fénelon, in which Mentor plays a conspicuous part.

MENZALEH, men-za'le, or MENZALA, Egypt, a large lake or lagoon (one of several at the Nile delta), extending from Damietta to the Suez Canal, and running parallel with the Mediterranean, from which it is divided by a narrow slip of land, from 2 to 12 miles in breadth Length of the lake from northwest to southeast, about 50 miles, average breadth, about 20 miles. It receives the Pelusiac and Tanitic branches of the Nile, and communicates with the sea by three openings called Dibeh, Gemileh and Om Farejeh. The lake is of comparatively recent origin, and covers what was a fruitful district of the delta, having formed through neglect of the dams. There is a small town of the same name on the south side of the lake. The Suez Canal cuts into its eastern edge from north to south.

MENZEL, men'zel, Adolf Friedrich Erdmann von, German artist: h. Breslau, 8 Dec 1815; d Berlin, 9 Feb. 1905. In 1830 his parents settled in Berlin, where his father had a lithographic studio, and where the son studied a little in the academy and more by himself. At 18 he published a cycle of lithographs called 'An Artist's Wanderings,' which immediately attracted attention; four years later he had begun to draw historical scenes from the past of Brandenburg and had commenced painting in oils with 'Checker-Players' (1836) and 'Judgment' (1837). About the same time his work as an illustrator opened up with the 400 pictures

for Kugler's 'Frederick the Great' (1840), in which Menzel showed himself original, dramatic and historically correct. This vein he followed out in his 200 illustrations for the 'Works' of Frederick the Great, and in 600 more accompanying a work on the army of Frederick the Great (1856), as well in his oil paintings, a dozen or more, of various scenes in Frederick's life. A trip to Paris in 1867, so the French critics claim, worked a change in Menzel's methods, so that he applied himself more to problems of light and shade After 1890 he used color less and less and in his pencil drawing broke away from mere line to the use of a cloudy treatment. He was one of the greatest of German artists of his day; and in 1899 he received the Order of the Black Eagle, conferring hereditary nobility Apart from his historical pictures, mention should be made of the 'Modern Cyclops' (1875), the interior of a Silesian rolling mill, with excellent lights, and of social satures like 'Carnival Morning' (1885). Consult Jordan, 'Das Werk Adolf Menzels' (1895); and lives by Sondermann (1895), and Knackfuss (1897); Singer, 'Drawings of Adolf von Menzel (London 1908).

MENZEL, Wolfgang, German author: b. Waldenburg, Silesia, 21 June 1798; d. Stuttgart, 23 April 1873. He studied at Jena and Bonn, became a follower of F. L. Jahn and the Turnerei, and was for four years schoolmaster at Aarau in Switzerland. In 1825 he returned to Germany, having already made himself known to the literary world by his 'Elastic Verses' (1823). He edited and contributed to magazines, and wrote a very great number of works, poems, romances, histories, criticisms, political polemics and Christian theology. From 1826 to 1848, and again later, he was editor of the Lutteraturblatt in Stuttgart. His chief writings include histories of Germany (1825), German literature (1827), German poetry (1858) Europe (1853-57), and the world ('Universal History' 1862-72) He also produced a work of mythological research (1842), a book on the pre-Christian doctrine of immortality (1869), and autobiographical memoirs (1876). He was often involved in controversy, assailing equal zeal theological rationalists and political radicals His attacks upon Goethe and other authors were fully equaled for virulence by the criticisms upon Menzel himself, made by Heine and some of the younger German writers.

MEQUINEZ, or MEKINEZ, Africa, a town of Morocco, 40 miles southwest of Fez. It is one of the capitals and the sultan maintains there a palace. There is a historic mosque and many other fine buildings, especially those of the 18th century, when the town was the preferred residence of Sultan Muley Ismail. There is an ancient city wall with nine gates, There are tanneries and potteries. Pop. 30,000.

MEPHISTOPHELES, mef-is-tof'e-lez, a name for the devil, which has been made popular by Goethe's 'Faust.' He was also a chief character in Marlowe's 'Dr. Faustus' Goethe derived it from an old popular legend, in which it is spelled Mephistophiles or Mephistophilis. The etymologies of the word are as various as the spelling. Some suppose it to be an irregularly formed Greek compound from the negative mē; phos, light; and philos, loving, thus signifying "not loving the light." Others

surmise that it may be derived from the Latin mephuts and the Greek phulos, in which case it will signify literally "loving the mephitic vapors of hell" The Mephistopheles of Goethe has little in common with the devil of the popular imagination. He appears, especially in the original form of the drama of Faust, as a real man of flesh and blood, who only preserves those traits of the popular devil of the Middle Ages which are compatible with a true human individuality—as the companion of Faust, as a selfish and malevolent votary of pleasure, always looking to the real, and bringing back Faust by cold and heartless irony, from barren speculation to the enjoyment of the present life.

MER DE GLACE, mar dè glas, France, an Alpine glacier on the northern slope of Mont Blanc, with an area of 16 square miles and an extreme length of about nine miles. It is formed by the confluence of three branches called the Glacier du Géant, the Glacier du Lechaud and the Glacier du Talèfre and is noted for its beautiful scenery. It ends as the Glacier des Bois whence flows the Arveyron River, in the valley of Chamouni. From the village of Chamouni the Mer de Glace is easiest visited and Mont Blanc ascended. The glacier has an average flow of two feet a day during summer and autumn.

MERAMEC SPRING, an unusually large spring in Phelps County, Mo, about seven miles south of Saint James. The water flows as an underground stream in limestone and emerges as a great spring with a flow averaging 125 cubic feet per second.

MERAN, mā-ran', Italy, a celebrated health resort in Tyrol, charmingly situated on the river Passer, near its entrance into the Adige, at the foot of a hill called the Kuchelberg. It is the chief town of a small district of the same name. It consists of an old and a new town, the latter with handsome villas and hotels, and numerous fine residences and old castles in the neighborhood. The old town is mainly on the Laubengasse, which is a long, narrow, winding street. The Polish church and other buildings date from the 14th and 15th centuries. It is believed to have been settled originally in the 9th century Lying in a sheltered situation on the southern slone of the Alps, it possesses a mild and equable climate, and is much frequented in winter by invalids with pulmonary affections. Permanent population 18,000.

MERCADANTE, Saverio, sä-vā'rē-ō měr-kà-dan'tā, Italian composer: b Albamura, 26 June 1797; d. Naples, 17 Dec 1870 He studied music at the college of S. Sebastiano in Naples under Zingarelli. From flute and violin he turned to vocal music; won great success with a cantata 'L'Unione delle Belle Arti' in 1818, and with an opera 'L'Apoteosi d'Ercole' in 1819; was made chapel-master of the Novara Cathedral (1833) and director of the Naples Conservatory (1840); and in 1862 became totally blind. He wrote many masses and other ecclesiastical music, such as 'The Sewen Last Words'; but is best known for his operas, of which the following, out of a total of 50, should be mentioned. 'Elisa e Claudio,' 'Il Bravo,' 'Il Giuramento,' 'I Briganti,' and 'Le due illustri Rivali.'

MERCANTILE AGENCY, a business enterprise, usually an incorporated company, which agrees to furnish subscribers who pay a yearly fee, with information as to the business responsibility, financial standing and credit rating of business houses, whether conducted by private individuals, firms or corporations. They also sometimes have a department for the collection of debts, and sometimes they sell two or three different services, at different prices. The business originated in the United States in 1837, following a financial panic, it being recognized that it was necessary for business houses to obtain better information in the giving of ciedits. Lewis Tappan was the founder of the first mercantile agency in New York City The most important agency is Dun & Bradstreet, Inc., a consolidation of the two agencies which had previously led in the business Merchants prize good ratings in the agency's large books which they issue usually once a year, and loan them to subscribers for their own use, in these books appear lists of addresses and the kind of business, followed by letters or signs indicating their financial responsibility, their promptness in paying bills, etc. Subscribers are also entitled to send in for special reports, giving more detailed or later information. The agency obtains its information—(1) direct from the parties in question, sending a representative to interview them, and asking for a statement, but in no case indicating who wants to know their standing; (2) by inquiry of the concerns from whom the party buys goods; (3) by exchange of in-formation between other agencies or people likely to know their reputation. Concerns that are noted in the agency books as prompt pay, or as being worth \$5,000 or more, are usually spoken of as "rated" houses. The highest rating is usually worth \$1,000,000 or more, and prompt pay

In addition to agencies doing a general confidential reporting business on all classes of business houses all over the country, there are others that confine themselves to a particular in-dustry, as Typo, which reports on the houses engaged in printing, publishing and allied in-dustries. The laws recognize that such exchange of information is legitimate, and essential to the conduct of business on a credit basis, and an action for libel in sending out a bad report will not hold against an agency that conducts its business in a fair manner However, the reports have to be made confidential: if promiscuously circulated, they might become libelous. For it unquestionably happens that at times the agencies report concerns as having less money and less standing than they are entitled to, and they can make mistakes. But as long as they try to be fair, and send out their reports under the seal of confidence, the law protects them. Abuse of the system, to revenge, spite or for blackmail, is practically unknown. The agencies are more apt to err in the matter of continuing to rate concerns too high when their financial standing is impaired. When large concerns have failed it has frequently happened that the mercantile agencies had continued to report them in good standing up to the last. Therefore the credit men of the large houses do not pin their faith entirely to commercial ratings, but use other means wherewith to know the truth. In the very large cities

there are credit men's associations, where they confer as to ways and means of keeping credits sate. While there is opportunity for better and more accurate reporting as to credits, it is true that the mercantile agencies of America handle their business extremely well, and constitute one of the most important links in the artificial chain between the industries of the nation. Consult Errant, "The Law Relating to Mercantile Agencies" (1889); Reinhard, "A Treatise on the Law of Agency" (1902).

MERCANTILE LAW. See COMMERCIAL LAW

MERCANTILISM. See Economics

MERCANTINI, Luigi, Italian poet: b. Ripatransone, in the Marches, 20 Sept 1821; d. Palermo, 18 Nov 1872. Against his inclinations he was intended by his father for the priesthood, but he deserted that vocation before taking orders and turned to school teaching For a time he was professor of Italian and Latin hiteratures in Singaglia. He wrote a number of patriotic songs, including "I tre Colori," but gained his greatest popularity by the song which is now the Italian national anthem or "Inno di Garibaldi." See Garibaldi Ilyans.

MERCAPTANS (Latin, "taking up mercury") or THIO-ALCOHOLS, in chemistry, a large class of substances having the same constitution as the alcohols, but differing from them by having the oxygen atom in the hydroxyl replaced by sulphin. They are only liquids or crystalline solids having an offensive, garlie-like odor, and are all insoluble in water. They possess acid tendencies that are more marked than those of the alcohols, and combine with metallic oxides to form salts which are known as "mercaptides". They combine with especial facility with mercuric oxide and take their name from this circumstance. Ethyl mercaptan is the best known members of the series, and it is this substance that is understood when "mercaptan" is spoken of, without further qualification. Ethyl mercaptan, Calla SII, is prepared by acting upon ethyl chloride, Calla Cl., with potassium hydrosulphide, HKS; the potassium atom and the ethyl radical changing places as indicated by the equation C₂H₆Cl | HKS | C₂H₆SH+ KCl | Ethyl mercaptan is a colorless, mobile liquid, boiling at 99° F. It is very inflammable, burning with a blue flame, and it mixes readily with alcohol and ether, though only to a very slight extent with water. Like the other mercaptans, it forms salts with the oxides of the metals, the hydrogen atom that is associated with the sulphur being the one that is replaced by the metal. The mercury salt, Hg(S. C2Hb)2, may be prepared very readily by agitating the mercaptan (or its alcoholic solution) with red oxide of mercury, HgO. Its formation is attended by the liberation of considerable quantities of heat, and the mercaptide itself is obtained in the form of soapy white scales. All of the metallic mercaptides are decomposed by hydrochloric acid. The mercaptans of fatty radicals all give a fine green color when treated with a solution of isatin in strong sulphuric acid and this reaction (as well as their insufferable smell) is used as a test for their presence.

MERCATOR, mer-kā'tor, Gerardus (Latinized form of (HERHARD KREMER), Flemish mathematician and geographer b Rupelmonde, Flanders, 5 March 1512, d Dursburg, 2 Dec. 1594 He studied at Louvain, and became a lecturer on geography and astronomy, making his instruments with his own hands. In 1544 he was attested for heresy, being liberal in his views. He escaped, but 42 of those arrested with him were burnt alive. Recommended to Charles V, Mercator entered into the emperor's service, and executed for him a celestial globe of crystal, and a terrestrial globe of wood. In 1550 he retired to Duisburg and received the title of cosmographer to the Duke of Juliers. His last years were devoted to theological studies. He is known as the inventor of a method of projection called by his name, in which meridians and parallels of latitude cut each other at right angles, and are both represented by straight lines, which has the effect of enlarging the degrees of latitude as they recede from the equator. The method is convenient in mapping small areas Ilis first maps on this projection were published in 1569 the punciples were first explained by Edward Wright, in 1500, in lus 'Corrections of Errors in Navigation,' whence the discovery has sometimes been attributed to him. His 'Tabulæ Geographicæ? (1578) is the best edition of the maps of Ptolemy. See Map.

MERCATOR'S CHART, or PROJECTION. See CHART.

MERCED, Cal., city and county-seat of Merced County, on the Atchison, Topeka and Santa Fe, the Southern Pacific and the Yosemite Valley railroads, 150 miles southeast of San Francisco. It lies in the valley of the Joaquin and Merced rivers, has a library, sanitarium, county hospital and courthouse. It has extensive farming, dairying, fruit growing and livestock interests. Pop. (1930) 7,066; (1940) 10,135

MERCEDES, mer-sā'dās, Argentina, town in the province of Buenos Aires, on the Pacific Railroad, about 50m. W. of the city of Buenos Aires. In 1779 it was founded as a military station. An Irish colony settled here about 1800. Mercedes is in a region where the chief occupation is raising sheep and cattle. It has several manufacturing establishments, among which are flour-mills, soap factories, and cattleyards. Pop. 18,256.

MERCEDES, Texas, city in Hidalgo County, alt. 61 feet, on the Missouri Pacific Railroad, 35m. NW. of Brownsville. Its industries include citrus fruit and vegetable packing and canning; cotton ginning, and oil. It has a mayor and council. Pop. (1940) 7,624.

MERCENARIES, or STIPENDIARIES, foreigners or others who received pay for their services as soldiers, especially as distinguished from government soldiers or those owing military service to the crown or nation. Hired professional soldiers appear very early in the history of military organization. Foreign mercenaries appear in the armies of Alexander the Great and the Romans. They were common in all armies, but generally engaged for a single campaign only. In England, Harold had a body of Danes in his army when he defeated the Norwegian king—the hus-carls, a body originally established by Canute. William III

had for some time a body of Dutch troops in his pay after he became king of England, and throughout the 18th century Hessian and Hanoverian regiments were constantly in the pay of the British government for temporary purposes. Hessians fought for Great Britain in the Revolutionary War; and the landgrave of Hesse who sold his troops at so much a head, received upward of \$2,500,000 for Hessian soldiers lost in that struggle. Americans have fought as hired soldiers in China, South Africa and in nearly all the countries of Central and South America. They are generally known as "sol-diers of fortune." Most of the officers in the regular Chinese army are either Englishmen or Americans. But most famous of all mercenaties were the Swiss soldiers, who were hired, sometimes by the cantons themselves, over all Europe, and formed many famous body guards. They were long employed by the French monarchs, and the Vatican at Rome still has its Swiss guards.

MERCER, mer'ser, Henry Chapman, American anthropologist: b. Doylestown, Pa., 24 June 1856, d 9 June 1930 Graduating from Harvard in 1879, he was curator 1894 to 1897 of American and prehistoric archæology at the University of Pennsylvania; honorary member of the United States Archæological Commission, Madrid, 1893. He was editor for anthropology in American Naturalist, 1893 to 1897: made extensive investigations and studies in anthropology in America, discovering several unknown extinct species, and 1897 to 1917, made and presented to the Historical Society of Bucks County, Pa, an extensive collection of objects illustrating the Colonial and early history of the United States by means of the implements and handiwork of the pioneer settlers. In 1916 he built and presented to the society a fireproof museum for preserving the above collection. He established a pottery at Doylestown, Pa, in 1898, experimented upon and developed the processes of the Pennsylvania Germans for making and decorating pottery, inventing in 1899 a new method of manufacturing tiles for mural decoration and in 1902 a new process for making mosaics; was awarded the Grand Prize, Saint Louis Exposition, 1904, and bronze medal for archæological work, Madrid, 1893; also bronze medal for tile work, Massachusetts Society of Arts and Crafts. He was a Fellow American Association for the Advancement of Science and member of the American Philosophical Society, the Academy of Natural Sciences of Philadelphia, the Numismatic and Antiquarian Society of Philadelphia, Geographical Society of Philadeler phia. His works include 'Lenape Stone' (1885); 'Hill Caves of Yucatan' (1896); 'Researches upon the Antiquity of Man in the Delaware Valley and Eastern United States' (1897); 'Tools of the Nation Maker' (1897); 'Tools of the Nation Maker' (1897); (1897); 'Tools of the Nation Maker' (1897); 'The Bible in Iron or the Pictured Stoves and Stoveplates of the Colonial United States. (1915); 'Ancient Carpenter's Tools' (1925).

MERCER, Hugh, American general: b. Aberdeen, Scotland, about 1720; d near Princeton, N. J., 12 Jan 1777. Educated as a physician, he served as surgeon's assistant in the army of the Young Pretender at the battle of Culloden Emigrating in 1747 to America, he settled in Pennsylvania, and resided there, in the

practice of his profession, until 1755, when he volunteered in the expedition led by Braddock to Fort Duquesne. Later he moved to Virginia and at the outbreak of the Revolution he joined the Continental army, and attained the rank of brigadier-general. He subsequently accompanied Washington on his retreat through New Jersey, and rendered valuable assistance at the battle of Trenton In the succeeding action at Princeton he was mortally wounded and died a week later. Mercer County, N J., was named in his honor Consult Goolitck, J T, "The Life of General High Mercer" (1906); 'Dictionary of American Biography' Vol. 12.

MERCER UNIVERSITY, Macon, Ga, a co-educational Baptist institution, opened at Penfield, Ga, as Meicer Institute on 14 Jan. Jesse Mercer, early conceiver and patron for whom the school was named, Adiel Sherwood, D D, who after coming to Georgia in 1818 established a theological school at his home near Latonton, and Josiah Penfield, of Savannah, who at his death in 1827 bequeathed a fund for educating young ministers Additional funds were provided by the Georgia Baptist Conven-

Conceived as a theological and classical school for ministerial students only, Mercer from its opening served a wider clientele, and m 1837 it obtained a charter giving it collegiate m 1837 it obtained a charter giving it collegate rank and changing the name to Mercer University. Thereafter it grew steadily Successive presidents were B. M. Sanders, who had served as principal of the institute, Otis Smith, John L. Dagg, N. M. Crawford, Henry H. Tucker (during whose administration the institution was moved to Macon, in 1871), A. J. Battle, G. A. Nimnally, J. B. Gambrell, P. D. Pollock of the first layman to become president). W. II. (the first layman to become president), W. II. Kilpatrick, C. L. Smith, S. Y. Jameson, J. F. Sellers, W. L. Pickard, R. W. Weaver, A. P. Montague, and Spright Dowell, who was elected in 1928.

During the administration of President Weaver, 1918-27, Mercer expanded rapidly. The campus was extended, new buildings were erected, the curriculum was revised, and nearly three-quarters of a million dollars were given to the institution by Georgia Baptists Another period of physical growth and curriculum adjustment followed the manguration of President Dowell. Mercer is now organized as a liberal arts college and school of law, with comprehensive curricula in the humanities, the social sciences, and the natural sciences. The working plant—17 large buildings and a number of cottages—is valued at \$1,150,000, and the endowment is approximately \$1,330,000. The plant, which includes three libraries, adequately meets the educational requirements of a student body numbering more than 500, and excellent recreational and dormitory facilities are provided for men students. At present, a dormitory for women is projected and a campaign to increase endowment has begun.

The teaching staff of professorial rank numbered 33 in 1939, offering courses in 20 major fields of study. Degrees conferred are B.A., B.S., LL.B., and M.A. Mercer is fully accredited by the various standardizing agencies, and the work done is accepted by the graduate schools of leading institutions in America and Europe.

Exceptionally large percentages of its alumni have entered the protessions of teaching, the ministry, the law, and the field of business administration. The institution is justly regarded as one of the most potent factors in the educa-tional and cultural life of Georgia and the Springer Dowell,

President.

MERCERIZING AND MERCERIZED COTTON. A process invented by John Mercet, of Lancashire, landand, for treating cotton liber or labries. The system was first patented in 1851. The process consists of steeping the cloth in a solution of caustic alkali, The cloth shrinks about one fourth and takes more bulliant colors in dyeing than unmercerized cotton goods. Cotton may be mercerized either in the yarn or in the cloth, and a variety of machines are made for this purpose. Some of these machines operating on the cloth employ a tension to obviate some after-shrinkage. This gives a greater yardage, but it reduces the gloss. The name has sometimes been incorrectly extended to sizing of cloth to give it a better sheen. True mercenzing gives a lustre to the cotton cloth, because the fibers are drawn closer and flattened, presenting a smooth surface that reflects the light. A variation in the caustic soda process is employed to give the modern crimped of crepe effects. Consult Murphy, 'The Textile Industries' (London 1912).

MERCERSBURG, Pa, borough in Frank-Im County; alt. 500 teet, near the western rm of the Cumberland Valley; 14m SW of Chambersburg and 21m NW. of Hagerstown, Md, served by the Pennsylvania Railroad It is situated in a productive agricultural region, in addition to local industries including a tannery, shirt factory, and lumber yard, there is a considerable trade in dairy products. Mercersberg Academy, a well known preparatory school for boys, had its origin here in 1830 with the founding of Marshall College. When Marshall College was moved to Lancaster, Pa., and combined with Franklin College in 1853, the Theo-logical Seminary and preparatory department remained in Mercersburg. From this Mercersburg College developed and was superseded in 1893 by the Academy. It was among the instruc-tors of the theological school that the «Mercersburg Theology» (q.v.) had its inception. Three miles from Merceroberg is Stony Batter, buthplace of James Buchanan, 15th President of the United States Buchanan made his home in Mercersberg from 1796 to 1809. The borough was first settled in 1730 by Scotch-Irish Presbyterians; the town was platted in 1786, and named for Gen. Hugh Mercer (q.v.). It was incorporated in 1831. Pop. (1920) 1,663; (1930) 1,634; (1940) 1,763.

MERCERSBURG THEOLOGY, a school of religious philosophy founded by F A. Rauch of the German Reformed Church in 1836, his work being taken up by John W. Nevin (q.v.) and Philip Schaff (q.v.). The name comes from the Mercersburg (Pa.) Theological Semmary of the German Reformed Church, whence the teaching of this system spread. The Mercersburg theology urged that the Church was not a voluntary contact of believers but a historic a voluntary society of believers but a historic and spiritual growth—an attitude showing markedly less hostility to the Roman Catholic

Church, that old confessions cannot express the modern faith in the Church; that the sacraments are more than symbols, that church worship should be orderly - hence the 'Liturgy' (1858) and 'Order of Worship' (1866); and that religious education is of prime importance

MERCHANT MARINE OF THE UNITED STATES. The United States merchant marine comprises all vessels of the nation engaged in waterborne commerce However, in general usage, it is considered to in-clude only that portion of our shipping which sails the seas, thus excluding vessels on the Great Lakes and on inland waters. It is distinguished, in addition, from the ships of the navy, which are sometimes known as the naval

The American merchant marine has had, since the earliest days of the country, two primary purposes first, to further and increase national foreign trade, and second, to assist in the national defense. Throughout American history it has been an instrument of national policy While it is pleasant to think of a ship as an instrument of peaceful trade between nation and nation, yet it is a fact that merchant ships have been used repeatedly for

military purposes

Under the Merchant Marine Act of 1936, the United States for the first time instituted a realistic policy concerning the operation and financing of the nation's merchant marine. The United States Maritime Commission was established and upon it devolved the duties of interpreting the major purposes of the act. UNITED STATES—New Federal Agencies)

In 1938 a program of shipbuilding, envisaging the construction of at least 50 ships a year for 10 years, was launched by the com-mission. These vessels are gradually replacing the slow and obsolete slaps which, as of the inception of the commission's program, comprised over 90 per cent of the nation's ocean-

going fleet.

Though the European war which broke out in September 1939 resulted in the temporary dislocation of American shipping and the cessation for the duration of the war of all ocean traffic with Europe under the United States flag, the merchant marine expanded in other waters, especially in trade routes to Latin America, Africa, and the Orient. Vessels originally operating in the Atlantic trades were, to a large extent, reabsorbed into active service by recharter, rerouting, or sale. The withdrawal of much European merchant shipping in non-Atlantic waters, as a result of the war, brought increased business to American vessels.

The navy drew on the merchant marine for many of its auxiliary vessels, thus vindicating the national defense aspect of the American merchant marine policy much sooner than any of the promulgators of the 1936 act had expected.

Despite this emergency defense value of the merchant marine, the fact remains that the primary function of a merchant vessel is to transport goods and passengers. The early years of American shipping were ones of peaceful development and aggressive mercantile adventur-

Colonial Period.—The white man first approached the shores of the newly discovered continent of America in a ship; and for nearly two centuries thereafter the sea and the inland waters were his chief avenues of communication. The whole early history of the development of the United States is closely interwoven with the history of the expansion of its merchant marine

Long before actual colonization had begun, the dating fisherman of the British Isles, the Dutch lowlands, and the rough coasts of Brittany had crossed the sea in their cockleshell fishing boats to reap the harvest of the Grand Banks—cod and other fish—and had used the forbidding shores of what are now Canada and the New England states as curing stations where

they salted down their catch.

The British, restlessly seeking expansion from within their small island territory, were the most daring of these fisherfolk, and it was they who first colonized America's eastern coasts. When King James made a grant to the Plymouth Company in 1606, it was primarily for the purpose of establishing a fishing colony where much of the work of curing the cod-catch could be done by the permanent settlers, rather than by men specially brought over with each vessel to do the task each vessel to do the task.

The first settlement on the northeastern American coast was known as the Popham colony, on the Kennebec River in Maine. It was here that the nation's merchant marine had its inception, in the fall of 1607, when the colonists laid the keel of the Virginia This was a seagoing pinnace of 30 tons, undecked, and propelled with two sails, and oars if the wind should fail In this frail craft the colonists fished the Banks, and even made a voyage from the Kennebec River clear across the Atlantic.

Though the Popham colony failed, the tradition for industry, daring, and ingeniousness established with the little Virginia carried the American colonists ahead until, about 200 years later, they were masters of sail and able to compete with the fleets of the world in foreign

That ships were absolutely necessary to the early colonists is evidenced by the fact that each one of the early settlements produced one or more sailing vessels within a short time after their founding. In 1611 the Jamestown colonists built a 13-ton shallop; in 1614 Adrien Block, of New Amsterdam, built a «yacht»—the first decked vessel constructed in the colonies; and in 1624, only four years after it was first founded, the Plymouth Colony of Pilgrims launched two small shallops to export cod to England. A shallop was a small, open-decked, two-masted vessel usually used for fishing purposes. Other shallops laden with fish sailed down the coast to trade with the Southern Colonies and the West Indies To avoid a profitless empty hold on the return trip, these vessels purchased cargoes that could be disposed of at home—sugar, rum, tobacco, and the like—and before long many of the ships were engaged entirely in carrying miscellaneous cargoes wherever profitable. In other words, they became our first merchant marine.

So urgent became the need for ships that in 1629 the first formal shipyard in America was established on the Mystic River in Massachusetts. The Puritans, settled at Salem, chose that location for the venture because it was well sheltered from the sea storms. On 1 July 1631, the 30-ton bark, Blessing Of The Bay, was launched from the Mystic shippards. Another yard, established the same year on Richmond Island off Cape Elizabeth, Me, built America's first ship for "export"—a sailing vessel for English purchase.

By 1635, less than 30 years since the launching of the first ship in colonial America, the British Admiralty announced that there were six American-built and owned ships in regular commerce between the colonies and the mother country. Thus aggressively was the maintime history of the Western Hemisphere originated.

Shipbuilding, in fact, was one of the major industrial pursuits of the colonies until the Revolution. The early American colonists faced a vast, wild, and forbidding limiterland. They scratched out small patches of ground on which the range of fifthern to the transaction of the property than the colories. to raise sufficient food to support themselves, and turned to the luximant forests which blanketed the continent for materials with which to build ships for trade. Not for decades did the exploring instinct take the colonists more than a hundred miles or so overland into America's interior; but from the start they treated the Atlantic as their highway, and plunged fearlessly into the forests to provide themselves with the stout timber needed for their ships. Even at that time, English forests were already impoverished, and American ships and shipbuilding materials became one of the country's major exports to England

While American shipping and shipbuilding were in the period of early growth, the mother country assisted it by laws, passed in 1046 and 1650, limiting trade with the colonies to vessels sailing under the British flag. This meant that American-built ships were for awhile given a practical monopoly (along with British vessels)

in colonial trade.

However, as American adventurousness in maritime trade and American industry in shipbuilding continued to increase, Great Britain changed her policy. In 1660 and 1663 navigation laws were passed requiring all major American exports to be transshipped through Finglish ports The colonists, however, were not men to submit to such tyranny; during the next century they turned to smuggling on a huge scale. They evaded the transshipment laws simply by not paying any attention to them, and by openly importing and exporting goods directly to America. Commerce seemed to feed on the British restrictions; it was as if the Americans were goaded to greater efforts by the high-handedness of the British kings and their representatives.

The story of the American merchant marine for the whole period from 1660 to 1770 is one of increasingly successful colonial shipping, working against an increasingly repressive policy on the part of the mother country. The colonists successfully boycotted British manufactures, and smuggling became not only respectable but

patriotic.

As an indication of the health of American commerce, the figures on shipbuilding are illuminating. In one year alone, 1769, the American colonies built and launched 389 sailing vessels. And in 1776, just at the beginning of the Revolution, it was estimated that over one-third of the British occan-going merchant marine was composed of American-built ships.

Among the major maritime occupations, other than smuggling, which flourished before

and after the Revolution were deep-sea fishing whaling, and slave trading Whaling, about which some of the most thrilling pages of American maritime history were written, started in 1712, and by 1770 Nantucket alone owned 125 whalers, which that year brought in a cargo valued at \$358,000 Slaving, too, was enormously probable, it laid the foundations of some of America's greatest fortunes

The Revolutionary Period—Not all was serene and prosperous, however While a few American merchantmen made over 700 per cent profits on single voyages, the great majority of them were not so fortunate. The British in the middle of the 18th century began wreaking havor on colonial slipping. Up to the Revolution they had captured over 300 American trading vessels, and had caused such a use in shipping rates that many foreign commodities were completely beyond the reach of the average American colonist. British raiding of America's "illicit" commerce may be said to have been the basic cause of the Revolution.

The Revolution nearly runed both Butish and American shipping. British war vessels and privateers annihilated the American fishing fleets, and either sank or captured more than 1.000 American merchantmen. They succeeded in brunging normal trade between America and Europe to a complete halt for several years. At the same time, American privateers, numbering over 1,600 vessels, together with the 30 ships of the American Navy, captured or sank as many as 3,000 British vessels. Of the 30 naval ships only nine remained at the end of the war, however; and according to most authorities it must be admitted that the British Fleet de-feated America at sea in the Revolution.

Moreover, though the privateers brought considerable assistance to the beleaguered American forces, the privateer tradition resulted in the growth of priacy after the war. The usual concept of our country's early merchant marine as a fleet of vessels valiantly lighting for freedom is not one entirely upheld by the facts. Smuggling, slaving, and piracy were the major sources of the private incomes of American shippers in those days. There were excellent reasons for this the British restrictive legislation both before and after the Revolution. But those reasons do not erase the picture of the American merchant marme of the 18th century

as a fleet of adventurers.

The first accurate figures on the deep sea tonnage of this nation were obtained in 1789, when 123,893 tons of American shipping were registered. The smallness of this figure resulted from the chaotic conditions at sea immediately following the Revolution. It was not until Congress first met as a body legally authorized to pass laws for the nation as a whole, in the year 1789, that the merchant marine had a chance to grow under normal conditions of national protection. In that year the first Congress required that only United States-built and owned vessels could be registered under the American flag. Another more important law established a discriminating duty of 10 per cent against all goods imported in foreign ships; and further, a discriminating tomage tax providing a differential nearly 10 times as high on foreign vessels as on American. The result of these discrimination laws was immediately evidenced. From the low tonnage figure of 1789, the merchant fleet of the United States jumped to 411,438 tons in 1792, three years later in 1789, 76 per cent of the total exports and imports were cent of m Jorcum ships; by 1794 the ratio had been startlingly reversed, and American ships were carrying over 88 per cent of American combined imports and exports

A number of causes, in addition to the country's policy of favoring United States shipping by means of discriminating duties and tonnage taxes, can be found for the relative prosperity of the American merchant marine during the 20 years from 1792 to 1812. Europe was in the throes of the Napoleonic wars much of the time, and both British and French fleets were busily engaged in lighting each other. Despite the runous embargoes placed on neutral shipping by both British and French during the 1800's, the United States merchant manne captured a large amount of the commerce of the world at that time

Moreover, new avenues of trade had been opened. In 1784 The Empress of China had made the first trip of any United States vessel to China, and the Chinese market for lurs, ginseng, and other commodities brought great profits to American traders. In 1789, 15 American vessels were counted in the Canton roads at one time. To make trade easter with the East, and to tap the enormous wealth in furs of the far West, John Kendrick and Robert Gray established the first fur post on the West Coast, in 1788. Captain Gray made the first round-the-world voyage under the United States

flag in the sloop Columbia, 1789-90

Finally, America's own coastal brought some prosperity to the nation's shippers. The law of 1789, which established discriminating tonnage taxes, was written in order to give once and for all a practical monoply in coasting to American ships. This law stated that American vessels in the coasting trade should pay the tonnage tax—\$6—only once a year Foreign vessels had to pay a \$50-tonnage tax every time they entered an American port Naturally, few, if any, foreign ships attempted to trade on that basis. In 1808 Congress explicitly forhade foreign vessels in the coasting trade, and it has been a national monopoly to this day.

An indication of the growth of the American merchant marine during this period is found in the increase in the United States tonnage registered for foreign trade: from 411,438 in 1792, to 984,269 in 1810—well over 100 per cent.

Smilar increases were made in the tomage of vessels occupied in coastal and inland waters.

From 1812 to the Civil War.—The War of 1812, resulting from the British policy of ruthless sea-raiding, impressment of American colleges and interferometers. sailors, and interference with United States trade, caused only a temporary interruption to American shipping, though it was catastrophic while it lasted More than 500 of the best American merchantmen were withdrawn from normal commerce to become privateers, supplementing the 23 vessels which then comprised the United States Navy. And while these privateers captured or sank well over 1,300 British merchant ships, the British Navy disposed of nearly an equal number of American vessels, causing a shrinkage in American tonnage in foreign trade from the nearly one million tons of 1810 to a little less than 675,000 tons

in 1814. American commerce declined from \$150,000,000 in 1810 to \$20,000,000 in 1814.

But foreign commerce revived soon after the war, and the merchant fleet of the nation grew to considerably larger volume than ever before. The China trade continued to expand; whaling, sealing, and other special fisheries trades brought millions of dollars into American tills; and the development of swift, regularly scheduled packet lines, prophetic of the coming of the chipper, brought more and more inter-

national trade into American ships

One reason for this expansion was the fact that in 1815 Congress passed a law prohibiting foreign vessels from importing any goods to the United States except from the country under whose flag they sailed. The law was used as a weapon with which the United States forced many nations to sign reciprocal trade treaties. Another reason was the general improvement in American ships. Builders had begun to study ship models and rigs, and were able to experiment with reference to the trade needs of the times Ships became larger, more maneuverable, faster According to many authorities, the period 1816-28 was perhaps the most flourish ing in all American maritime history United States ships were everywhere, in every port, competing on equal footing with the vessels of European fleets, and often walking away with much inter-European trade, as well as the bulk of the Far Eastern shipping and nearly 90 per cent of America's own imports and exports.

In 1828, Congress abandoned the preferential duty system, in accordance with the then popular free trade idea This revocation worked a temporary hardship on American shipping, causing numerous transfers to foreign flags and other defections from the merchant marine. In 1828 American registered tonnage numbered 812,619 tons; by 1830 it had fallen to about 575,000 tons However, it had returned to the 1828 level by 1834, and from then until the Civil War period (1861) the American merchant marine under sail grew by leaps and bounds. In that year it was registered at 2,540,000 tons nearly a fivefold increase in sailing ships alone. The enormous annual growth in immigration from 1825 onward meant profitable passenger lists, and resulted in new, swift, and luxurious types of cargo-passenger combination sailing vessels. Growing industries in the United States also produced more goods for export, and American tastes began to lean toward products of European refinement. All these things helped fill American ships

It was the great era of the packet line and the clipper A packet line consisted of a regular service for freight and passengers. Its vessels were common carriers, as opposed to the earlier type of sailing vessel which carried goods only for the owner, or for the owner and a few others who shared in the proceeds of the voyage.

The first American packet line was established between New York and Liverpool in 1816 the Black Ball Line. By 1836 there were 50 sailing vessels in the American packet fleet, running on regular schedules to many European ports, and also to Central American countries. These packets of the sail were relatively small, averaging less than 500 tons, although the Roscius, put into service in 1838, was a monster of 1,100 tons. Many of these packets made the Atlantic passage from New York to Liverpool in less than two weeks-magnificent time for

ships of the sail

John W. Griffiths, according to some authorities, was the man who invented the clipper type of merchant vessel. His first ship, the *Rambow*, went into service in 1841. One of his vessels, the famous Sea Witch, ran from Canton to New York via Cape Hoin in 77 days—record

time for a sailing ship

The full development of the clipper coincided remarkably with the opening up of the
West Coast of the United States in the days
of the Gold Rush American shipping during
the 1850's might have suffered considerable losses
owing to the introduction of steam vessels
and of heavily subsidized British lines into the
Atlantic trades, had it not been for the enormous trade with California which grew with
the exploitation of the West Coast gold fields
Right up to the beginning of the Civil War,
this trade brought unprecedented prosperity to
East Coast shippers, and was instrumental in
the development by Donald McKay of the most
famous clippers—the Flying Cloud, for instance,
which cut sailing time from New York to San
Francisco from 127 days to 89 days

Other famous American clipper builders were Brown and Bell, Howland and Aspinwall, and William H Webb, whose Helena competed with Griffiths' Rainbow for the honor of being the first true clipper. Some of these clippers were capable of 300 miles a day An average of 15 miles an hour under favorable winds was ordinary. The Sovereign of the Seas once sailed 437 miles in 24 hours—a record which many steam or motor vessels of today would find

difficult to equal

The repeal by Great Britain of its navigation laws restricting international trade in 1849 also opened up the Atlantic trades to United States vessels, and the clipper and early United States steamers for several years dominated the Liverpool run. With the end of the Crimean War in 1856, however, the seeds of decay were sown in the American merchant marine. Thousands of tons of British vessels were released to compete in international trade, and as a result, United States shipbuilding, the first of any maritime industry to feel the effects of a foreign trade depression, shrank from nearly 600,000 tons under construction in 1855 to only a little over 200,000 tons in 1860. The Civil War resulted in a complete stoppage of United States shipbuilding, and practically strangled the American merchant marine.

There are several important reasons for this decline, in addition to such incidental setbacks as those in the wake of the Crimcan War, the collapse of the gold boom in California, and the Civil War. For one thing, the immense wealth of the American continent was being opened up by the great westward expansion of the mid-19th century. Railroads were absorbing nearly all American capital; discovery and exploitation of American natural resources were luring American men from the sea of their heritage, inland to a new kind of life. The immensities of the American continent offered full scope for the expanding energies of the American people; and interest in the merchant marine in international trade sank very gravely as a result.

The development of steam navigation, and the adoption by European nations of consistent

policies of subsidization of their merchant marines, were other important reasons for the shrinkage of American shipping in foreign trade

The Advent of Steam.—In 1781 the Marquis de Jouffroy ran the world's first workable stramboat down the River Saone, in France. In the 1780's John Fitch of Philadelphia experimented with steam, and one of his vessels was in use as a packet between Trenton and Philadelphia in 1790 William Symington, a Scotsman, further developed and improved the steam vessel, his tug, the Charlotte Dundas, was in successful operation in Fighish waters by 1802 Robert Fulton's Clermont, first launched in 1807, was an adaptation of Symington's design for use on United States inland waters. All of these early steamboats were operated by paddle wheels, though John Fitch did experiment with series propulsion as early as 1787

Though the first steam and sail voyage across the Atlantic was made by the American Savannah in 1819, using wood for fuel, American steamship development was limited predominantly to the design of vessels useful for service on inland waters. It was not until the 1840's that the United States began to think in terms of regular transatlantic voyages for steam vessels, and then the subject arose only because of a new kind of competition which the British

were bringing into effect

The famous Great Western was the first British steamer to enter the regular transatlantic service; her first trip was made in 1837. However, serious competition with American sail packets began in 1840, when the first Cunard liner crossed the Atlantic, subsidized with a British mail contract of £80,000 a year. The United Kingdom also subsidized a steamship line to the West Indies in that same year. Though American sailing vessels for a while kept their advantage in freighting and in the Orient runs, the new, fast, regular British steamers began to eat into the American trade

for passengers and fast freight

As a result, Congress passed its first maritime subsidy legislation in 1845, appropriating \$400,000 annually for the Ocean Steam Navigation Company, New York to Southampton and Bremen, and further amounts to assist in the construction of steamers for the Liverpool run. The latter vessels were to be owned and operated by E.K. Collins, one of the first of the great steamship moguls of America. His four wooden sidewheel steamships competed effectively with Canard for several years during the 1850's, until Congress in 1858 withdrew the subsidies it had granted. Two other lines, the Sloo and the Pacific Mail, for South America and Pacific runs, both received subsidies. Because of the enormous profits made from the Gold Rush, they were able to make money. Collins, however, was constantly in financial difficulties, not only because of mismanagement, but also because of insufficient competitive subsidies.

When American policy turned against subsidies in 1858, the steamship lines were all, with one or two exceptions, forced to suspend operation. The percentage of the value of United States foreign trade carried in American ships dropped from 73.7 per cent in 1858 to 25 per cent in 1866. Our ships have never since regained as much as 40 per cent of the total import and export carriage of the United States trade.

The Civil War to the World War of

1914-18.—The Civil War did not, of course, destroy the United States merchant marine. but it did nothing to retaid the self-destructive tendencies which were already evident within it. Anglo-Confederate cruisers harried northern merchantmen, causing insurance rates to sky-rocket, and resulting in the transfer of over one-third of the total registered tounage of the Union to foreign flags. Shippards were abandoned, many vessels were sunk or captured, and many more merchantmen were taken from their accustomed trade routes and put into blockade duty around the ports of the Southern States. All this meant severe dislocation to the nation's shipping and its foreign trade as well.

After the end of the Civil War, American shipping in foreign trade continued to decrease steadily. There are many reasons for this, among the most important of which are the following. In the first place, United States shipbuilders and shipowners proved unusually reluctant to adopt the most modern and advanced type of ship. The iron ship had its first success in Great Britain, whereas Americans continued to build wooden vessels. This was owing to the fact that Britain's non technology developed at a swifter rate than America's, since a chronic lumber shortage in England made the use of non a necessity. The United States, on the other hand, had enormous reserves of standing timber, and American shipbuilders preferred to use that material rather than rely on the lagging and meflicient American iron founders for shipbuilding materials.

Moreover, although an American, John Eucsson, is said to have been the first to perfect a practical screw method of vessel propulsion, here also the United States lagged far behind the British in adopting that method of propelling its steam vessels. Ancient American sidewheelers were ploughing across the Atlantic long years after the British, with the aid of liberal subsidies, had replaced their older wooden vessels with relatively swift and safe iron ships

propelled by the screw.

In the second place, the pressure of the Western agricultural states against ship subsidies resulted in a complete absence of coherent subsidy legislation during the whole period American slaps found it impossible to compete with the large and regular mail subsidies paid to Cunard, by the British government. For a brief period, 1865–75, Congress subsidized a few lines to Latin America and the Orient; but as a result of scandals connected with payments to the Pacific Mail Line, all these subsidies were withdrawn. No payments were paid to steamship companies in competition with Great Britain on the important Atlantic run

from New York to England.

A third reason, previously mentioned, continued in effect with unabated force during the whole of the 19th century: and that is, the internal expansion of the nation, the develop-ment of American industry, the leap into boisterous manhood of an inventive people in a nearly self-sufficient land. American economy did not need a national merchant marine in those days.

Finally, a fourth reason for the continued slump in the registered fleet in foreign trade of the United States was, of course, the co-incidental profitable growth in the coastwise and intercoastal monoply of American shipping. While United States vessels in foreign trade

decreased in tonnage from over one and a half million tons in 1870 to under 800,000 tons in 1910, the tonnage engaged in the coastal, inland, and Great Lakes trades rose from 2,729,-700 tons in 1870 to 6,716,200 tons in 1910, over two and one-half times. It is an error to state that the American merchant marine has been in the doldrums ever since the Civil War. On the contrary. The coastwise and inland monopolies enjoyed by the shippers have always provided opportunities for many shipping firms. Only American ship operators in foreign trade have had to cope with the difficulties mentioned above, and it is in their business that the depression was worst That depression had but small effect on the nation as a whole, committed as it was to a high-tariff policy and a continued urge toward internal expansion. The merchant matthes of the world—British, German, Scandinavian, and so on-carried American exports and imports satisfactorily enough, it was thought. American policy was not committed to interrupting that foreign monopoly, and for nearly half a century no serious interruption ever occurred.

Nevertheless, many forces were at work to bring the nation back into the international shipping picture. Shipbuilders and ship operators both desired a larger portion of the American carrying trade The danger of monopolies abroad constantly suggested the possibility of prohibitive freight rates imposed by closely held European shipping combines. The need for a merchant marine in the organization of national defense was also often stressed by thoughtful

pcople.

As a result, in 1891, a conservative mail subsidy law was entered on the nation's books That its terms were not too generous may be indicated by the fact that of 53 lines advertised for by the Postmaster General, only eight were at any time in actual operation. A total of \$29,630,000 was spent during the life of the act, more than half of this sum going to ship lines operating in the transatlantic trades. Nevertheless, total expenditures were less than one-half those of Canada, and one-sixth those of

England during this period.

It was hoped by the promoters of the law that the subsidies would encourage the building of new ships for the mail lines. However, the advent of the Spanish-American War indicated that those hopes had not been translated into fact, largely because of insufficient operating bounties and the entire absence of financial aid for ship construction During the war period, 1898-99, Congress had to permit the temporary registry of 42,700 tons of foreign vessels, in order to cope with the problem of transporting United States troops and supplies to Cuba, the Philippines, and elsewhere. The army and navy bought another 94,000 tons of foreign shipping to care for their requirements. The actual tonnage registered for foreign trade decreased from 844,954 in 1896 (both sail and steam) to 826,694 in 1900

More generous operating subsidies and the institution of a policy of ship construction subsidies were constantly urged in Congress, but with no success up to the year 1916. The agrarian states, continuing to fear a rise in shipping rates, succeeded in defeating all attempts at establishing national protection for American

registered shipping.

In 1904, President Theodore Roosevelt persuaded Congress to create a Merchant Marine Commission, which was to investigate the American foreign trade fleet and suggest a constructive program whereby the United States could regain its former position in the occan-carrying trade. The commission found that the failure of the American fleet to keep pace with those of other nations was due to higher shipbuilding and ship-operating costs, and to the extensive foreign subsidies. It recommended a bounty of \$5 a ton to all American ships in foreign trade, and the establishment of 10 new subsidized lines to South America and the Orient, together with some assistance, indirectly, in the establishment of a permanent naval reserve. Congress, however, decided that the provisions of the bill were not equitable, and refused to pass it.

to pass it. The only additional assistance to United States shipping which the government was able to bring forward between the years 1898-1916, was the extension of the coastal monopoly. In 1898 and 1899, Congress expanded the once continental concept of "coasting" to include the island possessions of Hawaii and Puerto Rico, so that all trade between those islands and the United States was reserved by law to American ships. Likewise, trade via the Panama Canal from one coast to another, commonly known as intercoastal trade, was reserved to national shipping. The canal, which was completed on 15 Aug. 1914, created large new trading opportunities for American vessels.

Generally, however, the status quo on shipping policy remained unchanged from the end of the Civil War until the World War of 1914–18. Only one aspect of the United States merchant marine was drastically changed, and that

dealt with maritime labor.

In the spring of 1915 the Nelson Act, often miscalled the LaFollette Act, was signed by President Wilson. This law provided a «new deal» for American scamen. It entirely abolished imprisonment for desertion. It established a two-watch system for sailors and a threewatch system for the engine 100m; provided for payment of one-half of a seaman's earned wages when the ship entered a port; and penalized any payment of advances, since such payments were often used as methods of keeping men aboard ship after they had served their term at sea. It set up requirements for better working conditions, maining scales, and food Tests by the Department of Commerce were required before a man could receive his able seaman's certificate; and 75 per cent of the crew had to be able to understand the language of their superior officers, thus virtually eliminating low-paid Chinese crews on American vessels According to most authorities, the passage of the Nelson bill was an outstanding victory for Andrew Furuseth, the head of the International Seaman's Union

Also in 1914 there was a congressional investigation of liner shipping, and of the combinations in support of fixed rates into which various lines entered. These combinations are called conferences. The investigation discovered no discrimination against American ships, but did reveal certain unfair practices by the conferences, which were finally outlawed in 1916. These practices included deferred rebates, preference contracts with large shippers, and "fight-

me ships." The "fighting ship" was a vessel assigned by the conference to undercut the rates of monconference lines which were, in turn, undercutting the conference rates. Through the medium of the fighting ship, low-rate competition was kept off the seas. With the elimination of the discriminations above outlined, the conference system of interfine self-regulation has proved a sound way of avoiding cutthroat competition and a constantly bankrupt merchant marme.

The World War and Shipping .- The outbreak of the World War in August 1914, provided a major turning point in the history of the American merchant marine. For the first time in many years, the American flag once again became sought after for the protection of shipping. Registered touriage in foreign trade rose from 1,000,288 tons on 30 June 1914, to 2,185,008 tons on 30 June 1916. This increase was not, of course, due to new construction. Less new tonnage was built in 1915 than in any year since 1898. It was owing to two other causes. In the first place, it is estimated that in 1912 about one million tons of ocean slupping, owned and controlled by American capital, were operated under foreign flags. When the war began, a large number of these vessels returned to American documentation, in order to escape capture by the warships of belligerent nations Secondly, as freight rates began to increase and more and more ships belonging to belligerents were immobilized by the war, hundreds of thousands of tons of American coastwise shipping transferred from domestic to overseas routes to take advantage of the wartime prosperity in foreign trade.

The proportion of United States imports and exports carried in American vessels jumped from 97 per cent in 1914 to 163 per cent in 1916. A war-risk insurance law authorizing the Treasury to insure vessels at reasonable rates was passed in 1914. The high freight rates caused such a demand for shipping that buyers gladly paid up to \$300 a ton for ships which, before the war, could have been bought for \$60 a ton. American, shipping in foreign com-

merce boomed.

And still American shipbuilding did not noticeably increase. While there was a growth of approximately 100,000 tons in 1916, 120 fewer vessels were built than in 1915. This meant, of course, that there were more large vessels being constructed, but fewer ships of medium and small tonuage.

The enormous increase in freight rates brought about a congressional investigation in 1914, which discovered rate increases in cotton shipments from New Orleans to Liverpool, to take an example, of from \$2.50 per bale before the war to \$50.00 per bale in 1914. The farmers, as well as certain manufacturing interests, were directly affected by these high costs; and in 1916

a bill was passed to regulate rates.

The Shipping Board Act, as it was called authorized the establishment of a United States Shipping Board whose function was to supervise ocean freight rates. Deferred rebates, preference contracts, and «fighting ships» were all forbidden. All common carriers by water except tramp steamers (vessels not sailing regular routes, but doing a port-to-port business) were required to file their agreements with the board. The board was given power to disapprove,

cancel, or modify any conference agreements it found to be discriminatory or unfair.

President Wilson delayed appointing the members of the Shipping Board until March 1917, six months after the bill creating it became law, and by that time the nation was on the verge of a declaration of war with Germany The provision for government construction of ships was by that time the most important section of the act, and one of the first major steps of the newly created board was to set up (16 April 1917) the Emergency Fleet Corporation, to carry out the herculean task of building a wbridge to France. The funds carmarked for ship construction were increased in June 1917 from the \$50,000,000 provided in the act, to \$750,000,000, and before the end of the war, to a total of \$2,881,000,000. This sum was used for ship and shipyard construction alone. Other funds for the purchase and operation of slips already affoat brought the total spent on an emergency fleet to over \$3,000,000,000 by the time the program was completed

Despite the enormous size of the Emergency Fleet Corporation's construction program, however, it became necessary to charter foreign shipping once again for troop and supplies transport. Less than one-sixth of the Fleet Corporation's ship construction program was completed by the end of the war, and meanwhile the transport problems of the army and navy had to be solved. The government borrowed 1,200,000 tons of cargo shipping from Great Britain in September 1918 Troop transport vessels were also borrowed in quantity; it has been estimated that more than one-half of the United States troops sent abroad during the war period were carried in English, French,

and other allied vessels. Nevertheless, the Emergency Fleet Corporation, working at high speed, produced ships faster than they had ever been produced before. Early in 1917 the nation had 61 shippards with a total of 225 ways. On 11 Nov. 1918, there were 341 shippards with 1,284 launching ways in the United States. The number of workmen in the shipyards had increased from 45,000 to 380,000. As a matter of fact, the shipbuilding capacity of the nation became, during this war period, far greater than that of the United Kingdom. The tragedy was that America had, as in 1898, been caught unawares once again, and was unable to supply sufficient shipping for its wartime needs before the end of the war came.

During its whole period of existence, the corporation built 2,318 ships. Of these, 1,697 were steel vessels of all classes from cargo carriers (1,420) to harbor tugs (8) Wood vessels numbered 591, including 304 cargo ships; concrete vessels numbered 12; and composite (wood and steel) totaled 18. Of the steel cargo ships, 30 were built in Japan and 4 in China.

Tonnage figures, omitting the weights of ocean and harbor tugs of which there were 131, came to 13,666,711 deadweight tons Including approximately 4,700,000 tons of vessels, the contracts for which were cancelled at the end of the war, the Emergency Fleet Corporation's program envisaged a wartime fleet of over 14,000,000 gross tons. Some 5,000,000 tons of ships, over one-third of the total, were actually started after the Armistice, the last vessel built not being delivered until May 1922.

The Shipping Board's vessels were produced with haste in construction rather than excellence in performance as an aim. As a result, many of them were of poor quality, low speed, and short operating life. The corporation paid from \$150 to \$200 a deadweight ton, whereas, before the war, good steel cargo steamers were built in the United States for about \$65 a ton

Perhaps the most famous of the wartime vessel types was the Hog Island freighter, which was built on a mass-production basis at the shipyaid on Hog Island in the Delaware River near Philadelphia It became a distinctive part of the American merchant marine during the next 20 years. It was a steam, turbine-propelled, oil-burning cargo vessel, built of pre-labricated steel plates. Cargo capacity was 4,963 gross tons, length, 390 feet, beam, 542 feet; and depth, 27.8 feet. Its speed was about 11 knots

During the war, the shipping industry operated completely as an arm of the United States government. At the end of hostilities, the board found itself responsible for a huge, government-owned fleet which, under the law, it was obligated to transfer to private owners or operators within five years after the end of the war The Merchant Marine Act of 1920 was passed by Congress to enable a new Shipping Board to dispose of the vessels, and to assist private operators, under charter or as managing agents, in running them

The act also set up a construction loan fund of up to \$25,000,000 for loans to private companies to build new ships The coastal monopoly for American vessels was extended to include Guam and Tutuila (now known as Samoa) but

not to the Philippines.

The new board was authorized to consult with the Postmaster General concerning mail routes, and the latter official was given the authority to make contracts for the carriage of mail on Shipping Board trade routes without asking for competitive bids. However, these mail subsidy provisions were never put into complete effect. During the period from 1924, when the first subsidy was paid under the act, to 1929, when the Merchant Marine Act of 1928 went into effect, only \$4,801,953 was paid out in mail subsidies, and only six lines benefited.

Sale of the United States-owned ships procceded swiftly after the passage of the 1920 act By 30 June 1928, 1,164 cargo and other types of vessels had been sold at an average price of about \$18 a ton to operators who would agree to make a stated number of sailings in a stated trade with the ships they purchased Another large number was sold at approximately \$8 a ton to be scrapped. The Shipping Board itself operated vessels on several lines, usually at a loss. Finally, many of the remaining vessels were «laid-up»—temporarily retired from service.

The postwar world depression affected American as well as foreign shipping. At the same time that there were surpluses in ocean-going tonnage in every one of the major maritime nations, foreign trade dropped, and never, during the prosperous 1920's, rose to a point where the world's shipping was able to run at a profit on cargoes alone. Although the percentage of American foreign trade carried in American vessels rose from an average of 10.6

per cent in 1911-15, to an average of 35 per cent in 1921-30, the newer European postwar meichant fleets, subsidized both as to construction and as to operation by their increasingly nationalistic countries, undercut the relatively unsubsidized American fleet until it became obvious that most American shippers would be unable to continue in business without further assistance; this despite the fact that many of them had acquired their tonnage from the Shipping Board at what actually were sacrifice

In 1928, an effort was made to put America back into competition with the merchant fleets of other nations through a new Merchant Matine Act which authorized much heavier mail Construction of new vessels in subsidies. American shippards was required of recipients of the subsidies, and as a result, there began the first new ship construction since the World War. Forty-two vessels were built under the act, between 1928 and 1936, totaling less than half a million tons. Forty-three mail subsidy contracts were let, involving an average annual expenditure of a little less than \$20,000,000.

Even these sums of money proved insufficient to put the American merchant marine on its feet It is admitted today that the subsidies probably did not pull their full weight for the United States in the international competition for the carrying trade, since, as proved by the Black investigation in 1933, their recipients were not operating efficiently enough, or under the right type of regulations, to forward economical and successful shipping. Moreover, the continuing growth of the foreign trade fleets of England, Germany, Japan, and the Scandinavian ctuntries resulted in a world fleet much superior in size, speed, and efficiency to the American vessels.

The higher costs of American operation of shipping were due to three factors. First, and most important, were the much higher overhead and carrying charges on an average American vessel, unsubsidized as to construction and unassisted either directly or inductly in operation. Second, came increased costs in upkeep due to higher standards of subsistence and safety. Third, were the higher costs of labor on Amer-

ican vessels.

Whatever the causes, American shipping was in a bad way in 1935 and 1936. The Morro Castle and Mohawk disasters put before the American people and their government in shocking detail the wretched conditions concerning safety regulations, labor policy, and lax inspec-tions which then held within the merchant

The first attempts to improve the situation took the form of laws designated to improve safety and working conditions, the first such laws passed since 1915. The Bureau of Marine Inspection and Navigation was reorganized and its authority increased. Marine casualty boards were established to deal with questions of negligence leading to marine disasters on the

part of marine personnel.

The laws regulating labor conditions were revised. It was made obligatory that 65 per cent of the deck crew should be able seamen, 75 per cent of all the crew should understand English, and 75 per cent should be American Continuous discharge books took the place of the previous seamen's certificates, and

all members of the unlicensed maritime personnel were required to pass tests given by inspection boards set up for the task,

For United States ships a three-watch system, with an eight-hour day, was set up. Street inspection of scamen's quarters was provided for, and other improvements in working conditions were written into the law. Many of the labor gams registered in 1935 and 1936 were the result of agitation by the maritime unions.

Safety laws passed in 1935 and 1936 required sprinkler systems on ships carrying 50 or more passengers; patrol of shipping lanes containing ice hazards, rigid inspection of vessels carrying inflammable cargoes, extension of the provisions for safety concerning steam vessels to cover Diesel-operated ships, and many other techmeal improvements

Finally, the Roosevelt administration asked Congress in 1935 to give the United States a realistic policy for its ocean going merchant marine, and the right to support that merchant marine with direct and easily controllable sub-

As a result of the desire of the new administration for a sound shipping policy, the Merchant Marine Act of 1936 finally was passed and signed. One of the first actions of Mr Roosevelt as President had been to put the old Shipping Board into the Department of Commerce as the United States Shipping Board Bureau The new act abolished the bureau entirely, as well as the Merchant Fleet Corporation which had succeeded the old Emergency Fleet Corporation. It also established the United States Macitime Commission to administer the act, and authorized it to cancel the ocean mail contracts executed under the 1928 act. These contracts were cancelled by 30 June 1937, and claims totaling over \$73,000,000 were settled at a net cost to the government of approximately \$750,000

The chief feature of the legislation, however, was the frank power of subsidy which it granted the commission. The new subsidies were intended to give private industry the difference in cost between both construction and operation in the United States and in a foreign nation The act authorized the commission to establish rules and regulations which would assure efficient use of its funds, to provide for the determination of essential trade routes; to create minimum wage and manning scales and working conditions; to create a training program for American seamen, and to set up a construction program for the replacement of the country's

obsolescent shipping. The new commission made an extensive survey of the merchant marine as it then existed It discovered in this survey that over 90 per cent of the existing American merchant fleet in foreign trade would be overage by 1942. All of the Shipping Board vessels would be obso-

lete by that time.

The commission immediately embarked on a large-scale construction program, which envisaged the building of 50 ships a year for 10 years. By 1 Nov. 1940, contracts had been let for 179 cargo, cargo-and passenger combination, and tanker vessels. As of that date, 73 of these ships had been launched, of which 51 had been delivered and were in service. The vessels are in every way the most modern, most efficient, and most economical affoat. Designed for the most

part by the commission's own technicians, they are able to compete from every point of view with the world's best merchant fleets. Included in the program was the largest passenger liner ever built in an American yard, the America, which was put into service in the summer of

Subsidies on ship construction under the commission's program amount to between 30 per cent and 45 per cent of the actual cost of construction in American yards. Not all of its vessels are being built for private account, however, a few being constructed by the commission for charter to private operators. The government abandoned its last direct operation of merchant ship lines in 1939 Operating subsidy outlays m 1937, 1938, and 1939 averaged approximately \$13,000,000 per year.

New safety and maritime labor legislation adopted in 1935 and 1936 plus unusually high constructive standards have made the commis-

sion's ships the satest in the world.

The American Merchant Marine in the Second World War.—The merchant marine was confronted with one of the most difficult problems it had ever faced in November 1939, when the Pittman Neutrality Act prohibited American ships from travelling to belligerent ports or through combat areas as determined by the President. Following is a list of the essential trade routes which were determined before the war by the Maritime Commission, with those routes starred which were suspended in November 1939, or June 1940, for the duration of the Neutrality Proclamations

*New York to Hamburg via Channel ports

*New York to London

*North Atlantic to Holland and Belgium

North Atlantic ports to west coast of South America

Atlantic ports to cast coast of South America

*North Atlantic ports to Mediterranean and Black

North Atlantic ports to India
North Atlantic ports to Scandinavian, Baltic Sea ports and U.S.S.R.
New York to Mexico

Orient

North Atlantic ports to South and East Africa North Atlantic ports to west coast, Africa * North Atlantic ports to United Kingdom and Con-

* South Atlantic ports to United Kingdom and Contment

tinent
dulf to cast coast, South America

*Gulf to United Kingdom and Continent

*Gulf to Mediterranean
Gulf to Orient
Gulf to Ovest Indies
Round the-world components

*Pacific coast to cast coast, South America

*Pacific coast to United Kingdom and Continent
Pacific coast to west coast, South America

Puget Sound to Orient

In other words, of the 25 routes declared essential by the commission in 1937, 10, or two-fifths, were shut off as far as American flag shipping went. This meant a serious dissuption in the operation of America's foreign trade fleet, which for a while threatened many companies with serious economic shipping difficulties.

However, the coincidental withdrawal of thousands of vessels of belligerents from international trade and their absorption into strictly national services meant a wider scope for the activities of American shipping on neutral trade routes. This, together with the increases in freight rates in all parts of the world, served

to counterbalance to some extent the depressant effects of the neutrality shipping embargoes.

Moreover, the destruction of belligerent and even neutral merchant vessels increased the market value of the old United States ships. Hundreds of these old vessels were disposed of during 1940 at satisfactory prices to various foreign nations, and the newer vessels, whose customary routes were cut off by the Neutrality Act, were for the most part absorbed into the services from which the old ships were taken when sold

As of 30 Sept. 1940, the disposition of American sea-going merchant vessels, (steam and motor) of 1,000 gross tons and over was as follows.

Engaged in Foreign Trade	Number	Tonnage
Nearby Foreign (Canada, Centra America, West Indies)	al . 132	770,046
Overseas Foreign (South America Asia, Africa, etc.)	. 245	1,635,139
Total Engaged in Coastwise and Intercoast		2,405,185
Trades Total	. 699	4,042,769
Laid-Up Vessels Total	. 198	1,110,868
Giand Total	1,274	7,540,822

This compared with a prewar total, as of 30 June 1939, of 1,398 vessels, 8,134,000 gross tons, indicating that the transfer of United States vessels to foreign flags during the first year of the war had made but a relatively small change in the total tonnage of the nation's effective registered merchant marine. The addition of new Maritime Commission vessels at the rate of from 50 to 75 per year will help to take up any future slack caused by further transfers.

Furthermore, the construction of 200 «mass production» freighters for national defense purposes, as announced by President Roosevelt in January 1941, will serve to strengthen the American merchant marine during the war crisis and after. See also COMMERCE OF THE WORLD, INTERNATIONAL; MERCHANT VESSELS, NEUTRAL; Navigation Laws; Neutrality; Sailing Vessels; Shipping Industry and Construction;

STEAM VESSELS.

STEAM VESSELS.

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MERCHANT MARKS. See MONOGRAM; TRADEMARKS

MERCHANT OF VENICE, The. Merchant of Venice, entered in the stationer's register in 1598, and published in quarto form in 1600, was written about 1591 or 1595 Several stories that had long had currency in the world—notably the story of the caskets as a device for the choice of suitors by a wealthy heress, and the bond story of the rich Jew and his debtor - are happily blended in this play, and thereto are added the story of the rings, the romantic minor plot of Lorenzo and Jessica, and the comic character of Launcelot Gobbo Shakespeare never constructed a better plot, or one better calculated to win popular approval. It meets every demand of stage-management. Although the two main incidents-the choice of the caskets and the pound of flesh-are almost childrshly absurd, they are made to seem probable and even natural by the romantic atmosphere in which the characters move Whether walking the streets of Venice or watching the moonlight sleep sweetly upon the banks of fair Belmont we breathe the air of the Renaissance in Italy. All the characters fit in perfectly with this background except Shylock. Unquestionably to an Elizabethan audience the impression made by him was partly humorous and not at all typical. With his huge nose and the red wig of the traditional Judas he was fair game, not only for the characters in the play, but for those in the pit His practice of usury and his Jewish qualities rendered him the legitimate object of hatred and ridicule-his passionate words of rage only increased the laughter of an Elizabethan audience. While Shakespeare gave sufficient ground for this interpretation of the character, he has so humanized him as to produce a different effect on a modern audience. His famous words, «Hath not a Jew eyes, etc.,» are an instinctive protest against race halted and in favor of social sympathy. Whatever may be doubtful in the interpretation of Shylock, there is none in the interpretation of Portia. There is no better illustration of the power with which Shakespeare transformed his material than in the change of Portia from «a piratical and widowed siren, who persuades merchants to stake their all against her hand that they will possess her person, and who then drugs them at supper» into one of the most charming characters of all times. Her beauty of person, brilliancy of intellect, nobility of soul, and gift of poetical expression, all combine to produce an effect not surpassed by any other creation of the dramatist. She is the bond of mice butween dramatist. She is the bond of union between the casket story and the pound of flesh story, and all the other characters group themselves naturally about her. The concluding scene of the play at Belmont, after the excitement of the trial scene and the disappearance of the sinister character Shylock, is one of the supreme pas-

sages of poetry in the language -almost magical in its beauty of background and expression EDWIN MIMS.

MERCHANT VESSELS, Neutral. At the Washington Disarmament Conference of 1921 22, Phhu Root remarked, as to the term merchant vessel, that it scould not be made clearer by the use of definitions which would only serve to weaken and confuse it.» In general, the term refers to any vessel not owned or operated by the government of any state, though even this distinction is clouded by the recent practice in which governments have engaged, that of owning or operating vessels tor commercial purposes. In time of peace, such a vessel encounters conflicts of jurisdiction as it moves from one country to another Upon the high seas, it is subject to no interference or control by any state other than its own, within the territorial waters of a foreign state, it is, for the most part, subject to the jurisdiction of that state. In time of war, the merchant vessel encounters much more difficult and dangerous problems. If it belongs to the enemy, it is subject to capture, or even to destruction. If it belongs to a neutral, it is subject to the international law of neutrality

Nationality. A neutral merchant vessel. according to the code prepared by the Research "in International I aw (see bibliography below)
"is a merchant vessel entitled to fly the flag of
a neutral state." The flag is presumptive evidence of its neutral character, this presumption is open to challenge, because it has long been an accepted ruse de guerre for a belligerent vessel to carry a neutral flag. The ship must be legally registered with some state, and one state only, to be entitled to carry its flag. The purpose of such registration, said the United States Supreme Court in the case of the Mohawk (3 Wall, 571, 1865), wis to declare the nationality of a vessel engaged in trade with foreign nations and to enable her to assert that nationality wherever found »

Transfer.- On account of the hability of enemy merchant vessels to capture, their owners have frequently sought to transfer them to neutral registry at the outbreak of a war, or when was was imminent. Whether such transfers are legal and entitle the transferred vessel to the immunities of a neutral, are questions which have been much debated. British and American practice during the 19th century admitted the validity of transfers made during, or in contemplation of, war, provided they were bona fide, that is, if the transfer was a fully perfected transaction, in which the purchase price had passed from the purchaser to the former owner, the ship being actually delivered and duly registered in accordance with the registry laws of the state whose flag it was to fly the former owner reserving no interests or title in the vessel so transferred. ('onsult the cases of the Benito Estenger, 176 U. S. 568 (1899); the Ariel, Moore's Privy Council Cases IX, 128 (1857); the Roelfina, American Journal of Intertional Law, Vol. 16, p. 136 (1922). During the American Civil War, large numbers of vessels under American registry were transferred to neutral flags in order to avoid capture by Confederate cruisers. The French and Russian rules, however, denied the legality of all such transfers made after the outbreak of war, An

attempt was made at the London Naval Conference in 1908 to harmonize the conflicting views, and a draft treaty was actually adopted. This Declaration of London, however, was never ratified, and its rules cannot be regarded as binding upon belligerents. During the World War (1911-18), the question was raised in the case of the Dacia, a Hamburg-American liner which, while lying in an American port, was purchased by an American citizen and given American registry. On a subsequent trip it was captured by a French warship and condemned by a French court. A British court, following British precedents, would probably have released the vessel; it was doubtless arranged, for this reason, that the capture should be made by a French cruiser. In view of the treatment which neutral merchant vessels received during the European war which began in 1939, the transfer of vessels to neutral registry offers little advantage

Neutral Character.—A neutral merchant vessel, once its neutral nationality is clear, may lose some of its neutral rights through its behavior. Many cases and statutes offer justification for capture of a neutral merchant vessel which is carrying enemy initiary persons, conveying dispatches or transmitting military intelligence, accepting charter from a belligerent, piloting a warship, or providing other such services. Thus, in the case of the Orozembo (6 C Rob. 430, 1807), an American vessel was condemned by a British prize court for carrying three enemy mulitary persons and two civil offi-cials to an enemy colony. In various cases it has been held that the master's ignorance of the fact that dispatches were being carried in his vessel, or even that he acted under compulsion by the enemy, afforded him no excuse. It now seems to be the majority opinion that a neutral vessel sailing under enemy convoy is subject to condemnation; indeed, during the World War and the European war which began in 1939, German warships sank such vessels without warning and without safety for the crews. In the case of neutral vessels participating in hostilities, as by fighting, bringing supplies to warships, transporting troops, transmitting intelligence by radio, etc., the penalty is more severe than condemnation; such vessels may be treated as enemy warships and sunk at once. Unrestricted submarine and air attacks on neutral vessels raise the question whether they should be permitted to aim themselves; if they do so, they would probably be treated as enemy warships. Congress was unwilling to accept President Wilson's recommendation that United States neutral vessels should be armed; the current Neutrality Act forbids arming them for more than internal discipline. As war is now waged, such questions are of no more than academic interest; any neutral vessel is in

Neutral Risks.—According to the law of neutrality, neutral mer 'nant vessels are entitled to navigate the high seas in time of war as in time of peace, subject to certain restrictions and risks imposed for the benefit of the belligerent. If the vessel is carrying contraband of war to an enemy, or running a blockade, it is subject to capture, and it or its cargo or both may be confiscated, if lawfully condemned by a prize court. (See Contraband; Blockade; Prize Courts and Prize Jurisdiction.) For the pur-

pose of ascertaining whether a vessel is carrying contraband or running a blockade, a belligerent warship may order a neutral vessel to stop anywhere upon the high seas, and may there visit and search it in order to ascertain its true character. If such inspection reveals enough evidence, the ship may be ordered into a port of the belligerent, and there held until its fate is decided by a prize court, in accordance with the rules of international law. (See Right of Search.) In recent wars, however, neutral vessels have been ordered into port, even by radio, for visit and search at the convenience of the belligerent, and at great delay and cost to the vessels themselves. This practice was protested by the United States during the World War of 1914-18, but without success; it is now a regular practice. Indeed, during the World War, a system of "navicerts" was introduced by England, which in the European war that began in 1939, came into regular use. Under this system a neutral vessel is inspected at its port of departure by a British official, and, if no objection can be found, it is given a certificate which, in general, though not absolutely, relieves it of visit and search en route.

Further invasion of the right of neutral vessels to use the high seas is found in the announcement by belligerents of war zones. It was formerly held that a belligerent could not declare a zone of the seas from which neutrals could be excluded; modern warfare disregards this principle. A belligerent now sows mines within a declared area, or sinks neutral shipping in this area (or anywhere else) by submarines or bombs from above. The fact that the neutral vessel has a legal right to proceed in these waters is of little value to it when it may be sunk without warning Neutral states are entitled to protest against such injury; such protests are ineffective unless backed by force. The United States, which had defended its neutral rights for a century and a half, announced that it would not defend those rights, in its neutrality legislation, first passed in 1935. Under this statute, the neutral United States itself declares (combat zones) into which American vessels may not proceed. It should be noted that this is domestic law, and does not change international law.

Destruction of Vessels.—The above statements lead into the broader question of the right of a belligerent to sink a vessel without warning or adjudication, and without assuring the safety of persons on board. International law has always maintained that the lives of those on board merchant vessels must be protected, and therefore that the ship must not be destroyed, but must be taken into port. In the Russo-Japanese War, a Russian cruiser sunk the Knight Commander, a British merchant vessel, on the ground that lack of fuel and of men for a prize crew made it impossible to take the captured vessel into a Russian port. England indignantly protested this as a «very serious breach of international law»; but seven other neutral merchantmen were destroyed by the Russians during this war. The problem was much discussed at the Second Hague Conference, but no agreement was reached. At the London Naval Conference of 1908-09, the general principle was affirmed that a neutral vessel cannot be destroyed but must be taken into a prize court for adjudication, but exceptions were

made for cases in which such conveyance of the puze to port would mean danger for the captor or for the military operations in which he was engaged. This declaration was never ratified. During the World War of 1914-18, the Germans were unable to take captured vessels into their own ports because of the British blockade, and therefore sank them. Further, the use of the submarine, which obviously could not take prizes into port or even save the lives of those on the vessel destroyed, extended the danger to neutral vessels. More than 800 neutral ships were sunk during the World War. In the buropean war which started in 1939, the greater use of the applane made possible greater destruction of vessels—again with the impossibility of saving lives therem. Millions of tons of shipping, a large part of it neutral ships, were sunk without warning. Thus, because of new methods and machines of wartare, and because of the totalitarian character of modern war, the belligerent may be expected to destroy recklessly whatever neutral vessel comes within range of his suspicions or declared zones, it is mevitable that he should do so, and international law cannot prevent it unless neutral states combine to protect their rights by physical force, or unless the community of nations prevents war. In this interdependent world, shipping is as important a part of warmaking as are gims.

Neutral vessels in beligerent jurisdiction may be requisitioned for use by the beligerent, subject to adequate compensation. The uncertainterm "angary" has been applied to this procedure. It is a sort of "emment domain" in modern war, the beligerents control the moverments of neutral vessels to a very large degree without taking them over. Thus, the Alfied Supreme War Council, during the World War, was able to tell neutral vessels when and where they should sail, what cargoes they could carry, and what could be unloaded at each port.

War and law are antitletical. As the range of modern war has increased, the protection which international law can give has diminished; this situation will continue until war is brought under control. Until that time, the neutral merchant vessel must face far greater risks than ever before in its search for profit during wartime. See also International Law; International Law, Changes in; Neutrality.

Bibliography.—Full references to literature and cases, as well as complete information to its date, may be found in the dialt-treaty prepared by the Research in International Law, entitled Rights and Duties of Neutral States in Naval and Aerial War, published separately by the Carnegie Endowment for International Peace, and also as a supplement to The American Journal of International Law, Vol. 33, July 1939

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MERCIA, mer'shi-a, England, the largest kingdom of the Saxon heptarchy, now comprised in the Midland counties on both sides of the Trent from the North Sea to Wales, Mercia was founded by Crida in 585. Like the other Anglo-Saxon kingdoms it had a stormy history, being almost continually at war with some of its neighbors. In 827 it was conquered

by Febert, who united the different kingdoms of England into one. As its Frontiers extended to those of the other kingdoms, as well as to Wales, it derived its name from that circumstance (Anglo Saxon mears, march of boundary). See England, Geographical History.

MERCIE, Antonin, an tō-năn mer-se-a, French sculptor and painter b Toulouse, 30 Oct 1815. He studied under Jouffroy and Falguere, won the first Prix de Rome in 1868; and in 1852 obtained a medal of the first class for his bronze statue of the young David, now in the Luxembourg. His masterpiece was 'Gloria victis' (1851), tollowed by a nude throned Juno (187); a marble statue of 'Painting' (1890), 'Wilham Tell,' now in Lausanne; monuments to Thiers, Merssonner (in front of the Louvie), and Jules Ferry, and 'Napoleon' on the Vendome Column | He painted a Venus, now in the Luxembourg In 1891 he was elected an Academician. Died, 14 Oct. 1916.

MERCIER, Charles Alfred, American Creole author b. McDonogh, near New Orleans, 3 June 1810; d. New Orleans, La., 12 May 1894. His father was a native of Louisiana and his mother, Ploise Le Duc, was a Canadian. At the age of fourteen he went to France and studied classical and modern literature at the College Louis le Grand. At first destined for the law he turned to literature, returned to Louisiana in 1838, and spent some time in Boston during which he perfected his knowledge of English, Returning to Paris, he published an Onental story in verse, 'Ta Rose de Smyrne' in 1840; C. Finute du Niagara,' a mystery play. In the next tew years, Mercier fraveled extensively on the continent and composed the drama Henoch Edesias, which was lost during the revolution of 1848. After the revolution he studied medicine and returned to practise it in New Orleans, but soon returned to Paris. He disapproved of slavery but considered the Civil War as a trumph for Anglo-Saxon civilization and scored it in 'On Pan Latimsme on la Necessite d'une Alliance entre La France et la Confederation du Sud' After the close of the Civil War he returned to New Orleans and engaged in the practice of medicine. He contimed his writing, however, and Le Fou de Palerme' appeared in 1873. In 1876 Mercier founded the Athence Ionisanais, an organiza-tion having for its object the preservation of the French language in Louisiana Thereafter much of his literary effort appeared in the Comptes Rendus of the Athence. Of his later works, 'Emile des Ormiers,' the story of a Paris painter, and the drama 'Fortuna' have had the most enduring fame.

MERCIER, Desiré Joseph, Belgian cardinal, archbishop of Malines and primate of Belgium. b. 21 Nov. 1851 at Braine-l'Alleud; d. Brussels, 23 Jan. 1926. Educated at Louvain, Paris and Leipzig, he was ordained priest in 1874 and became professor of philosophy at the University of Louvain. Here he organized the Institut Supérieur de Philosophie, based on the teaching of Saint Thomas Aquinas and founded under the auspices of Pope Leo XIII. As a distinguished lecturer Professor Mercier—as he then was—earned a high reputation for literary and scientific abilities, united with

zeal, leadership and exalted purpose He wrote several volumes of note, eg, Les Origines de la Psychologic Contemporaine' (1897), 'Métaphysique (rénérale' and 'Critériologie,' which passed through numerous editions, as well as others of a less didactic character. He was also the founder of the Revue Neo-Scholastique when officiating as head of the school of neoscholastic philosophy On 8 Feb 1906 it was announced that "I'r Meiciei, piesident of the Institute of Advanced Philosophy at Louvain," had been appointed archbishop of Malines Though at first a general surprise, the appropriateness of selecting him to the episcopal bench soon became apparent With energy and annability he devoted himself to the administration of his diocese, and on 15 April 1907 was created and proclaimed cardinal and pri-mate of Belgium. The German conquest of Belgium in the early stages of the European War brought him into world-wide prominence by the fearless and determined attitude he adopted toward the ravagers of his country. In the papal conclave of September 1914, after the death of Pope Pius X, a number of the assembled cardinals decided to give Mercier their vote in the election for a new pope as a demonstration of sympathy with Catholic Belgium. He was supported by the French and English cardinals, while the Germans and Austrians protested against what they called undue interference of politics in the highest spiritual functions of the Church, and Cardinal Della Chiesa was ultimately elected Cardinal Mercier arrived in London 12 Sept. 1914, and on the following day (Sunday), accompanied by the late Duke of Noi folk, was received in audience by the king and queen. In the afternoon he witnessed a remarkable and enthusiastic demonstration in Westminster, organized by Irish members of Parliament and attended by many thousands of people. He returned to Belgium the same night and excited himself during the long period of the German occupation to ameliorate the sufferings of his compatriots. He came into frequent collision with the German authorities, notably von Bissing (qv.). The cardinal's pastoral letters, collected and published by Burns and Oates (London 1918), form a series of carnest exhortations to the practice of Christian fortitude and hope amid the horrors and afflictions of war

MERCIER, Honoré, Canadian lawyer, Journalist and politician. b Iherville, Quebec, 15 Oct. 1840; d Montreal, 30 Oct. 1894. He was educated at Saint Mary's (Jesuit) College in Montreal and afterward studied law at Saint Hyacinthe, being admitted to the bar in 1865. During his legal studies (1862-64) he was editor of the Courier de Saint Hyacinthe, the Conservative organ of the district; but as a journalist he was among those who opposed Canadian Confederation. This led him to abandon his editorship and to sever his connection with the Conservative party. During the years immediately following the confederation of 1867 Mercier devoted himself to his profession, but in 1871 he reappeared in politics as the leader of the National party (also called the Partinoir), whose leading aim was to curtail the power of the Dominion government in favor of provincial rights. On this platform he was elected to the federal Parliament for Rouville in 1872, but did not stand for re-election to

the Parliament of 1873. After some four years devoted to the successful practice of law at Saint Hyacinthe, Mercier was elected (1879) to the legislative assembly of Quebec, being appointed solicitor-general of the province in the ministry of M Joly On the defeat of the Joly administration in the same year, Mercier passed into the opposition, of which he presently became leader. In 1881 he left Saint Hyacinthe to practise law in Montreal. In 1885 the French Canadian population was thrown into a ferment by the trial and executhrown into a ferment by the trial and execu-tion of Louis Riel, the leader of the North West Rebellion (qv). Mercier, heading the agitation thus occasioned, declared Riel to have been a "victim of the fanaticism of Sir John A. Macdonald" On the strength of the feeling thus aroused, the Conservative party was defeated in the provincial elections of 1886 and Mercier found himself at the head of the ad-ministration. In this capacity he carried through the legislature the famous Jesuit Estates Act, a measure intended to compensate the Jesuits for the property confiscated by the Crown at the time of the papal dissolution of the order In spite of the agitation throughout Canada against the act the Mercier government was upheld in the election of 1890. In the same year grave charges of peculation were brought against the Premier and his colleagues on the ground that a subsidy of \$100,-000, intended for the Baie des Chaleurs Railway, had been diverted to political uses Investiga-tion resulted in the dismissal of the ministry (15 Dec. 1891), action which was ratified by the overwhelming defeat of the Mercier party in the election which ensued The criminal charges brought against Mercier, as a result of this and a second official investigation, ended in a verdict of not guilty Mercier remained a member of the assembly but with diminished influence and shattered health

MERCUR, mer'ker, James, American soldier: b. Towanda, Pa, 25 Nov 1842; d West Point, N Y, 22 April 1896. He was graduated from West Point in 1866 and commissioned in the engineering corps. He was engaged in surveys made under the government and in 1867-72 was assistant professor of natural and experimental philosophy at West Point, after which he was in command of an engineering corps and in 1876-81 assisted in clearing the New York harbor of the obstructions at Hell Gate He was professor of civil and military engineering at West Point from 1884 until his death. He published a revised edition of Mahan's 'Permanent Fortification' (1887) and the original works, 'Elements of the Art of War' (1888); and 'Military Mines, Blasting and Demolitions' (1892).

MERCURIC CHLORIDE. See CORROSIVE SUBLIMATE

MERCURIC CYANIDE. See HYDROCY-ANIC ACID

MERCURY, mer'kū-ri, the Roman god Mercurius who presided over commerce and gain. See HERMES

MERCURY, the planet of the solar system which is nearest to the sun. Owing to the position of its orbit, far inside of that of the earth, it is never seen by us at any great distance from the sun, but seems to swing back and forth, first on one side of the central lumi-

nary and then to the other. (See Solar Sys-Its time of revolution is a little less TIM) than three months and therefore less than onefourth that of the earth. When, starting from a point between the earth and the sun, it has completed a revolution, the earth has moved forward in its orbit, and, in consequence, nearly 30 days more are required to catch up with the earth and again come into conjunction with it Consequently the time of one synodic or apparent revolution is nearly four months. It follows that its greatest elongations from the sun occur at intervals of nearly 60 days, alternately to the east and to the west. When near its greatest eastern clongations it may be seen in the west toward the close of twilight. When west of the sun it may be seen in the morning before daybreak. To the naked eye it seems to shine as a star of the first magnitude. But as it is never seen in a perfectly dark sky except when very near the horizon, it is not readily observable in high northern latitudes. It is said, in fact, that Copernicus died without ever seeing this planet.

With the aid of a telescope, Mercury may be seen the greater part of the time-- in the afternoon when it is east of the sun; in the morning when it is west of it. But it is never seen fully illuminated unless near the faither part of its orbit, beyond the sun, when it may be lost in the effulgence of the sun's rays When it approaches nearest to us, only a small portion of the hemisphere presented to us is illuminated. Owing to these unfavorable con ditions observations on it are extremely diffi cult, and it cannot be said that anything is certainly known of its physical constitution. The difficulty is increased by its being much the smallest of all the major planets. The result is that nothing is positively known as to the time of the rotation on its axis. About 1800, Schroeter, a celebrated observer of the planets, thought it rotated in a little more than 21 hours. But Herschel found no foundation for this belief, and could see no evidence whatever of a rotation. About 1889 Schiaparelli, the celebrated Italian astronomer, making a very careful study of the planet, under the favoring sky of Milan, was led to the conclusion that, like the moon, Mercury's time of rotation was the same as its time of revolution in its orbit, so that it always presented the same face to the sun. A similar conclusion was reached by Lowell at the Flagstaff Observatory. But the difficulty of seeing any well-defined features on the planet is such that conservative astronomers are still in doubt on the subject, and regard the time of rotation as still unknown and not likely soon to be determined.

The most remarkable feature presented by the motion of Mercury is that the perihelion of its orbit is found to move forward considerably faster than it ought to by virtue of the attraction of the known bodies of the solar system. The cause of this motion has perplexed astronmers for half a century; it was at first supposed by Leverrier to be due to the attraction of one or more unknown planets between Mercury and the sun. Another explanation was sought in the assumption that the sun's gravitation diminishes somewhat more rapidly than it would according to the law of the inverse square. If this were so, the perihelion of all the other planets

ought to be affected by a similar motion, and in particular there should result disturbances in the motion of our moon which, now that the extremely abstruce mathematical theory of that body (based upon the law of gravitation), has been so perfected, it is certain do not exist. Similar discrepancies have been detected in the motions of some of the other planets, notably in the node of Venus and in the perthelion of Mars. When the disturbing pull of the exceedingly tenious, lens-shaped (doid of particles known as the Zodiacal Light is computed and allowed for, it is found that not only these, but also the historic discrepancy in the motion of the perthelion of Meicury, disappear. It is very probable that the true explanation of them is to be found in this source.

At varying intervals the motion of Meicury in its orbit carea, the planet to pass between the earth and the sun, it is then seen as an intensely black, round dot crossing the sun's disc. The next tour transits will occur on 7 May 1931, 8 Nov. 1937, 10 May 1937 and 1.2 Nov 1940 None of these will be visible, however, from the United States. The first transit which will be completely visible here will occur on 13 Nov 1963 and o Nov. 1960. But little use is made of transits of Meicury Attempts have been made to detect traces of an atmospheric ring about the planet during the transit, as may be done during a transit of Venus (q.v.), but these have not been certainly successful. Newcomb subjected 21 transits from 1677 to 1881 to a critical discussion to ascertain whether there might be found from them any indication that the time of rotation of the earth on its axis, the unit of time throughout astronomy, had changed during this interval. There was found no conclusive evidence in any appreciable change in the length of the day. It has certainly not increased or dimmished by so much as 0.01 second in the course of the past 2,000 years. ERIC DOOLITTLE,

Late Director Flower Astronomical Observatory, University of Pennsylvania. 16 MERCURY, Fulminate of. See Fulmi-NATES.

MERCURY, or MARKERY, a perennial herb (Chenopodium bonus henricus) of the natural order Chenopodiacee Like other members of its genus, it has mealy foliage and inconspicuous greenish flowers. The tender shoots which appear in early spring are valued as a substitute for spinach, for which purpose the plant is frequently cultivated. In Europe it is better known as Good King Henry. It will grow in any garden soil with practically no attention.

MERCURY, Medical Uses of. Mercury uncombined is used only for its bulk. As its without medicinal effect, at one time as made as two pounds of uncombined mercury would be given for the purpose of mechanically dislodging some obstruction in the intestines. Triturated with some other substance it is valuable medicinally and produces specific mercurial effects, local and constitutional. Such compounds are "blue mass" (blue pill), mercury with chalk (grav powder), mercurial ointment and mercurial plaster. All mercurial compounds entering the circulation have a peculiar influence

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over nutrition. This is especially true of salts of mercury, such as mercurous chloride or calomel, mercuric chloride or corrosive sublimate and mercurous todide or the green iodide of mercury. In small doses, especially in syphilis, mercury has a definite toxic action on the spirochete which is the known parasite which causes syphilis. In large doses mercury acts as a corrosive poison and tends to inflame the mucous membrane of the mouth, stomach and intestines. Calomel and blue pill are largely used for their laxative effects. Mercury in the various forms of powder, onitment, lotton and plaster is used to remove body-vermin, relieve itching and as a teniedy in certain skin affections. Mercuric chloride, known as corrosive sublimate, is a powerful antiseptic and is taken internally in very minute doses. See Toxicology

MERCURY, or QUICKSILVER, a metallic element which has been known for many centuries and which is distinguished from the other metallic elements by the fact that it is liquid at ordinary temperatures Mercury occurs native in the metallic form, but by far the larger part of it is obtained by distilling the native sulphide, cinnabar (Hgs), in a current of air which is regulated so as to burn the sulphur of the sulphide, while leaving the mer-cury in the metallic state Cumabar occurs Cumabar occurs abundantly at Idria, Austria, at Almaden, Spain, and at New Almaden, near San Francisco Bay, and it is from these sources that the mercury of commerce is chiefly obtained occurs as veins and disseminated deposits, the ores of which are believed to have been introduced by hot waters of magmatic (q v.) origin. spain is the largest producer and the chief output in the United States comes from California, though deposits are known in Texas and Oregon Mercury freezes at 37.9° F. below vero and boils, at the ordinary atmospheric pressure (760 mm.), at 675° F. Its specific gravity at 32° F., when compared with water at 39° F, is 13596. Its specific heat at ordinary temperatures is about 0 0331, and its average coefficient of expansion between 32° F. and 212° F is 0 00010085 (Fahrenheit scale). The ratio of the specific heat of the vapor at constant pressure to its specific heat at constant volume pressure to its specific heat at constant volume has been found, experimentally, to be 1.666, which indicates that the molecules of the vapor are monatomic and that they behave, so far as their collisions among themselves are concerned, as though they were elastic spheres. (See Gases, Kinetic Theory of). Mercury may be freed from dust and dirt by filtering it through leather. To remove the lead and other through leather. To remove tin, lead and other dissolved metals, the mercury may be left for some weeks in contact with concentrated sulphuric acid and subsequently digested with dilute nitric acid; or it may be several times distilled Various other modes of purification are also known.

The metal is chiefly used, in the arts, for the extraction of gold from crushed ore or fine gravel, the ore being washed by a gentle stream of water over a copper plate which is amalgamated with mercury. The gold particles, being heavy, sink through the water so as to come into contact with the copper plate, where they are held by the mercury in the form of a gold amalgam. (See Gold and Amalgam). In physics, mercury is also greatly used for filling

thermometers and barometers, and for many other purposes. It is likewise used in medicine, both in the metallic form and in its compounds with other elements. Metallic mercury, when tubbed up in a mortar with confection of roses until its globules are so fine as to be indistinguishable to the eye, is known as "blue mass" and is administered in the form of pills, as a cholagogue.

Mercury has the chemical symbol Hg (from "hydrargyrum," its Latin name), and an atomic weight of 2003 if O=16, or 1988 if H=1 It forms two oxides, each of which give rise to a series of stable salts. The metal does not oxidize upon exposure to air at ordinary temperatures, but when heated nearly to its boiling point in air or in oxygen it slowly oxidizes, with the formation of mercury monoxide (or mercuric oxide), HgO. When prepared in this manner the monoxide is crystalline and red, and for this reason it is familiarly known as the "red oxide". The same substance may be prepared in an allotropic form by precipitating a solution of mercuric attract by the addition of caustic potash, the monoxide then coming down as an amorphous yellow powder The red oxide turns black when strongly heated, but re-covers its color upon cooling. When heated to covers its color upon cooling redness the monoxide decomposes into metallic mercury and free oxygen It can, therefore, be used as a source of oxygen; and it was in fact by heating this substance that oxygen was first discovered by Priestley By acting upon the red oxide or upon metallic mercury by excess of nitric acid, mercuric nitrate, Hg(NO2)2, 18 formed; while if nitric acid is allowed to act upon excess of mercury, mercurous nitrate, HgNO₃, is obtained The corresponding sulphates of the metal are obtained by acting upon metallic mercury with sulphure acid, mercuric sulphate (HgSO₄) or mercurous sulphate (Hg₂SO₄) being obtained, according to the conditions of the experiment Mercuric sulphide, HgS, which occurs native as the mineral cinnabar, and which is also known as vermilion, is bright red in color and may be prepared artificially by heating mercury with sulphur, or by passing sulphuretted hydrogen gas through a solution of mercuric salt. When obtained in the latter way it comes down as a black amorphous powder, which may be brought into the normal red crystalline form by sublimation. Mercury forms two chlorides which are extensively used, especially in medicine Mercuric chloride (also known as "bichloride of mercury") or "corrosive sublimate"), HgCl₂, is prepared by heating a mixture of equal parts of mercuric sulphate, HgSO₄, and common salt, NaCl; the reaction being HgSO₄ + 2NaCl = HgCl₂ + Na₂SO₄. The bichloride is fairly soluble in water and dissolves readily in a solution of sal ammoniac. It is also quite soluble in alcohol It crystallizes in the trimetric system, melts at 509° F. and boils at 563° F. It is intensely poisonous and is one of the most power-It is used in surgery ful germicides known and medicine as an antiseptic and disinfectant, and is occasionally administered internally in very small doses Mercurous chloride, HgCl (more familiarly known as "calomel," or as the «mild chloride»), is a white powder, insoluble in water and is greatly used in medicine, both as a cholagogue and otherwise It may be prepared in various ways, but the usual method is by heating four parts of corrosive sublimate with three parts of metallic mercury; the mercury combining with half of the chlorine of the corrosive sublimate, as indicated by the equation $HgCl_2 + Hg = 2HgCl$. The caloniel sublimes and must then be ground to a fine powder and thoroughly washed, in order to remove any free soluble corrosive sublimate that may not have been decomposed. The so-called "white precipitate," which is obtained when ammonia is added to a solution of corrosive sublimate, has the composition NHLIgCl. Mercurous oxide, of "black oxide of mercury," HgCl, may be obtained as a black powder by digesting caloniel with excess of caustic potash. It decomposes into the red oxide and metallic mercury upon exposure to light, or upon being heated to the boiling point of water. Many other compounds of Meneral Suppliers.

MERCURY VAPOR LAMP. See VAPOR

MERCY, Fathers of, Roman Catholic religious congregation founded on the restoration of Louis XVIII, 1814, and approved of by the Pope (1834) under the title 'Society of the Priests of Mercy'. The object of the society is the conversion of sinners by mission preaching and the practice of the corporal works of mercy. In 1839 the order founded houses in New York and Samt Augustine, Fla., and the fathers have churches for the French population in Brooklyn and Manhattan. The mother house was originally at Paris, but was removed to Rome in 1903 as a result of the Association Law. Consult Delaporte, 'Vie de Jean-Baptiste Rauzan' (1857).

MERCY, Sisters of, a name given to members of several religious communities founded for the purpose of nursing the sick at their own homes, visiting prisoners, attending lyingin-hospitals, superintending the education of females and the performance of similar works of charity and mercy. Communities of Sisters of Mercy are now widely distributed over Europe and America. There are also religious orders under the same name connected with the Anglican Church. The term is applied more speculcally to the Order of Our Lady of Mercy, a Roman Catholic order founded for the objects above enumerated in Dublin 1827. The first above chumerated in Dublin 1827. house in America was established in Pittsburgh, Pa., 1843, and from it have sprung 65 convents. Consult Leaves from the Annals of the Sisters of Mercy (1881). See McAuley, Catherine.

MERCY-SEAT (Heb. Kappo'reth, covering or lid, that is, of the sacred ark in the ancient Jewish tabernacle), an unfortunate and inappropriate term as applied to the cover of the chest or ark containing the two tables of the law and overspread by the wings of the Cherubim Between these wings appeared the Shekinah or fiery symbol of the divine presence hovering over the mercy-seat, which consisted most probably of a sheet of the finest gold (Ex. xxv, 17, etc; xxx, 6; xxxi, 7, etc). The New Testament writers seem to hold that the term contains by implication the idea of the propitiation (qv) (Heb. ix, 5; Rom. ii, 24). The high priest sprinkled on it the blood of the yearly atonement, and some writers think that the term covering as applied to it refers more to the covering of or atonement for sins than

to its use in covering the treasures of the ark In any case the idea of a seat, as if the expression in Psalins xers, I, "he sitted between the cherubins" referred to the earthly tabernacle, is mappropriate. Consult Prateinas, 'De Judea Arca' (1727), Weiner, 'De Propitiatoria' (1695). See Shekinah

MEREDITH, George, English poet and novelest: b. Hampshire, 12 Feb 1828; d. London, 18 May 1909. Details of Meredith's life are meagic, little is known of his parentage or of his education except that he was sent to school in Germany and later studied law, which he gave up for literature. For a time he was a pupil of T. L. Peacock (qv), whose daughter became his first wife. His residence was for some years at Box Hill in Surrey.

His first work in literature was a volume of poenrs published in 1881. This was followed, in 1850, by 'The Shaving of Shagpat,' a bulliant. fantastic Oriental tale in which some interprefers have professed to see a political satire. In 'The Ordeal of Richard Feverel' (1859). however, he began the course of studies in human temperament which have made his name The novel, unquestionably one of the most powerful in the language, deals with the ordeal of adjustment to the world of a highspirited youth, it is the conflict between temperament and desire, represented in the hero, and a variety of conventions, most ngidly typified in the "system" of his tather, Sir Austin Feveral The effect of the book is chiefly tragic 'Tyan Harrington' (1861), the next novel, is wholly come in idea; the characters are embodiments of various "humors," most strikingly represented in the intriguing Countess; the plot, as in all of Mereduli's novels, is quite secondary in interest and springs from the characters 'Modern Love,' a sequence of brilliantly phrased, intricate, 16-lined sonnets, was published in 1801 Emilia in England, now called 'Sandra Bellom,' appeared in 1864, and its sequel 'Vittoria' three years later. The story is that of a young Italian girl of unaffected manners and character and her life among people of very diverse temperaments and social ideas, the theme of the novel may be regarded as the conflict, among very real people, of the genuine with the sentimental character. Between the two novels appeared, in 1805, 'Rhoda Fleming,' perhaps the simplest of all Meredith's novels in style and a powerful study in character—It deals, on the whole, with a conventionally more humble order of society than is usually found in Meredith's novels, and is rather more direct, but few things in fiction are more impressive than the almost instinctive steadtastness of the heroine or more gloomy than the spiritual confusion that she tries to set in order. In 'The Adventures of Harry Richmond) the note is again chiefly conne. Much of Meredith's best work lies in the freshness of the varied scenes of this book, and in the hero's father is perhaps as typical a character of the novelist as can be found, a man whose adventurous tancy and devotion to his son "informs" numberless odd and extravagant acts. Another excellent study of a different sort is 'Beauchamp's Career' (1876) It is the analytical, yet lively, story of a young man whose carnestness of character and whose activity caused him, from a conventional point of

view, to fail in life Like other of Mereduth's novels it is a great contribution to our understanding of the varieties of human temperament

and to our sympathy with them
In (Beauchamp's Career) perhaps more than in any of his preceding novels Meredith directly explained his aim in drawing character, it was to present a type of motive and to show how it dominates and gives unity to a series of acts The motive which causes action is, so to speak, temperamental rather than deliberate; in typical examples like the Countess in Evan Harrington, or Beauchamp, for instance, Meredith is interested in the expression of temperament tather than a story. The Countess, on the face of the matter, wished for the social advancement of her lannly; what she really wanted was scheming for the sake of scheming and her social ambitions were but the medium of expicssion. This manner of approaching character, indeed, dominated all the character drawing in Meredith's novels, but it was not expressed as a deliberate theory until the publication, in 1877, of 'On the Idea of Comedy and the Uses of the Comic Spirit'. The essence of this essay is that comedy is one of the most wholesome and effectual ways of probing and purifying the ills of the world, that good comedy, as in the plays of Molière, really enables the reader to recognize what is genuine and discard what is sentimental; unfortume and discard what is sentimental; unfortunately, instead of good comedy we often are treated, in most literature, to painful moralizings. Mereduth's fullest and finest expression of this idea is in his 'The Egoist' (1879), unquestionably his masterpiece and one of the chief glories of English fiction. Egoism, that love of self which prevents men from seeing things in their true relations is one of the things in their true relations, is one of the fundamental failings of mankind and Meredith has drawn it, in the inimitable Sir Willoughby Patterne, as a figure of colossal proportions. The novelist's skill and dispassion-ateness as an artist was never better shown than in the fact that he refuses to give conventional rewards and punishments; for the hero's unfailing egoism permits him in the end to turn to the flattering of his vanity what would ordinarily be regarded as humiliation.

Pursuing his end, an analysis and a synthesis of the springs which govern action, Meredith in his next novel, 'The Tragic Comedians' (1880) took a story from contemporary European court life and explained it as a piece of dramatic psychology. The comparative shortdramatic psychology The comparative shortness of the novel makes it a good study of the author's method. This novel, too, indicated a tendency on his part to depict the motives and the psychology of people actually in existence rather than, as in 'The Egoist' and its predecessors, to draw the embodiment of a type of "humor." This tendency was certainly evident in his next novel, 'Diana of the Crossways' (1885), his greatest popular success, and is shown in the fact that certain of the incidents snown in the fact that certain of the incidents and characters excited curiosity as, to their originals. It is manifest also in his last three books, One of Our Conquerors' (1890), 'Lord Oimont and His Aminta' (1894) and 'The Amazing Marriage' (1895), which are perhaps less broadly representative and more particular than his earlier novels Meredith's writings also include four short stories, 'The Tale of Chloe, 'The House on the Beach,' (Farina)

and 'The Case of General Ople and Lady

Camper.

Meredith, who was one of the last great novelists to hold over, as it were, from the age of Victorian literature, belongs to the so-called psychological school, of which the great popular representative is George Eliot, with whom he is practically contemporary. He differs from her in several important respects: The comedy of character (as the term is understood with Cervantes and Molière) as well as the tragic side of life, is reflected in his pages. His attitude is detached and impersonal and he never allows his sympathies to intrude upon his study of the type he is treating, a characteristic which accounts for the criticism sometimes made that he lacks temperament and which is doubtless one of the reasons for his comparative unpopularity He is more interested in his characters as types of temperament than as individuals, and in this field he has perhaps represented the greatest range and variety of human motive that is to be found in English fic-Taking strata of society, on the whole, conventionally above those treated by George Eliot, he has made them representative of a great variety of "comic" motives As a moralist, his attack has been upon those types which are broadly termed sentimental, and in this respect his pictures of such men as Wilfred Pole and Willoughby Patterne are inimitable. The and Willoughby Patterne are inimitable. person that he most approves is the simple, considerate, intelligent being, well represented in such minor heroes as Merthyr Powys, Vernon Whitford, Dartrey Fennellan and Tom Redwonth and pictured to the height of brilliancy in his real heroines. In no other novelist, in no English writer except Shakespeare, can be found so splendid a galaxy of women Rose Jocelyn, Janet Ilchester, Renée, Cecilia Hilkett, Jenny Denham, Clara Middleton, Emilia, Carintilia Large and many others, as well as such thia Jane and many others, as well as such older ladies as Lady Jocelyn and Lady Charlotte Eglett, are the best tribute to womankind that English literature possesses, and the creation of them is an achievement of the very first non of them is an achievement of the very first rank. His style is frequently criticized as involved and epigrammatic, but no novel contains passages of greater poetical charm. See DIANA OF THE CROSSWAYS; EGOIST, THE; ORDEAL OF RICHARD FEVEREL, THE.

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ican edition of the poems and novels is by Messrs. Scribner, in 16 volumes Commentary is scattering and appears chiefly in the form of contemporary reviews. Consult Brownell, 'Victorian Prose Masters' (1901); Lynch, Hannah, 'George Meredith' (1891); and, for a varied symposium, LeGallienne, 'George Meredith' Some Characteristics, with a Biblioge Characteristics, with a Biblioge Characteristics. dith, Some Characteristics; with a Bibliogoun, Some Characteristics; with a Bibliography by John Lane; and for his place in the history of the novel, Cross, 'The Development of the English Novel' (1899). Consult also Ellis, S. M, 'George Meredith: His Life and Friends' (London 1919).

W. T. BREWSTER, Professor of English, Columbia University.

MEREDITH, Louisa Anne Twamly, Australian author and artist: b. Birmingham, Engtranan author and artist: b. Birmingham, England, 20 July 1812; d Hobart Town, Tasmania, 21 Oct. 1895. She had already published a volume of verse (1835); and 'The Romance of Nature,' illustrated by herself (1836), before she married her cousin Charles Meredith (1839) and removed to Australia, whence they went to Tasmania five years later. She continued her literary activity till the end of her long life and for many years before her death had been the most prominent Tasmanian author. Among her books, many illustrated by herself, are 'My Home in Tasmania' (1852); 'Over the Straits' (1860); 'Tasmania: Friends and Foes, Feathered and Furred' (1880). Her prose works were popular in Australia and had also a circulation in Eugland and this country, and her verse, of which she published several collections, was at once pleasing and impretentions.

MEREDITH, Owen, the pseudonym of Bulwer-Lytton See Lytton, Edward Robert Bulwer.

MEREDITH, Samuel, American patriot and first Treasurer of the United States b Philadelphia, Pa., 1740, d 10 March 1817 His father was a Welshman and a friend of George Meredith became a member of Washington the Pennsylvania colonial legislature, and when the American Revolution broke out he entered the Colonial army as major, took part in several battles and was made brigadier general for gallant services. He gave £10,000 in silver for carrying on the war, and was exiled from Philadelphia when the British occupied it. Meredith served in Congress in 1787-88 and in 1789 became the first Treasurer of the United States, advancing to the government, on taking the office, \$20,000 and later \$120,000, for which he was never reimbursed. He remained in the office of Treasurer until 1801.

MEREDITH, SIR William Ralph, Canadian jurist: b Westminster, Ontario, 31 March 1840; d. 22 Aug. 1923. He was educated in the University of Toronto and was admitted to the bar in 1861, beginning practice in London, Ontario. He became queen's counsel in 1870 and in 1881 removed to Toronto. In 1872 he entered the provincial legislature of Ontario as member for London and for 16 years he was leader of the Conservative opposition during the long reign of Mowat as Premier. In that position he showed a disposition to subordinate provincial rights to those of the Dominion; and he was an advocate of manhood suffrage, secret ballot, the enlargement of powers to municipalities and workmen's compensation. In 1894 he was appointed chief justice of the Court of Common Pleas and in 1912 chief justice of Ontario. In 1896 he was appointed a commissioner for the revision of the provincial statutes, and in 1905 he was one of the commission that investigated the affairs of Toronto. He was knighted in 1896, and became chancellor of the University of Toronto in 1900.

MEREZHKOVSKI, Dmitri Sergeyevich, Russian critic and novelist: b. Saint Petersburg, 1865. He was educated in his native city and published his first volume of verse at the age of 23. In 1893 he published an essay on the decadence of Russian literature which attracted general attention. In 1901–02 appeared his 'Critical Studies of Tolstoy and Dostoyevsky as Men and as Artists' and 'The Religion of Tolstoy and Dostoyevsky,' which proved him a critic of high order. Next there appeared his trilogy of historical novels dealing with the perennial conflict between Christianity and

parament Collectively known as Christ and Antichrist, this work has appeared in most modern languages. It includes 'Smert Bogov' (Eng. trans, 'The Death of the Gods,' London 1901), in which the chief character is Julian the Apostate; 'Voskresenie Bogo' (Eng. trans, 'The Forerunner,' ib 1902) with Leonardo da Vinci as chief character, and 'Antikhrist: Petr. Aleksyey' (Eng. trans, 'Peter and Alexis,' London 1905). He also wrote the dramas 'Paul P' (1908) and 'Alexander P' (2 vols, 1913). Consult collected edition of his works (15 vols, Saint Petersburg 1911, 12), and Phelps, W. L, 'Contemporary Russian Novelists' (Boston 1913).

MERGANSER, or FISH-DUCK, a duck of the cenus Mergus, distinguished by the slender cylindrical bill, the upper mandible terminating in a strong hooked "nail," and the margins presenting the appearance of rows of tooth like processes. The most widely distributed is the red breasted (Mergus serrator), known as sheldtake in America where it is less numerous than in the Old World. The goosander (M merganser) and the nun or sinew (M albellus) are tamiliar European and Asiatic species, while the hooded merganser (Lophodytes cucultatus) or sawbill is familiar in North America. The mergansers feed chiefly upon fishes and swim and dive after then prey with great case and dextenty are essentially northern in their distribution. breed in the far north and migrate southward on the approach of the colder season. The nest is built of grass and roots and is lined with down. It is usually placed in a hollow of the bank near water, but some species prefer the greater security of a hollow tree. The flesh is coarse and rank. Eight or 10 species are known in various parts of the world. The female alone incubates, but the male watches near the nest. From 8 to 14 eggs are laid and the young enter the water as soon as they are hatched.

MERGENTHALER, mer'gan-ta-lèr, Ott-mar, American inventor: b. Wurttemberg, Germany, 10 May 1851; d. Baltimore, 28 Oct. 1899. He was a watchmaker by trade; came to the United States at 18, entered the employ of the United States government at Washington, where he kept clocks and electrical bells throughout government buildings in order; improved apparatus used in the signal service, and in 1870 removed to Baltimore, where he devoted himself to perfecting a type-setting machine. On this he spent several years, his scheme going through four stages, the last of which was the linotype (qv.). When he had patented this machine he had much difficulty in introducing it. It was perfected by the addition of the Rogers spacer and numerous minor inventions by Philip T. Dodge and others, brought its inventor large profits and is now in very common use in large printing establishments. Mergenthaler also invented a machine for making fruit gift-baskets of veneered wood,

MERGER, in law, the sinking or obliteation in conveyancing of lesser estates or property into greater ones, or the consolidation of two or more estates; a term used in financial or business circles, meaning the consolidation or combination of a particular class of manufactories, railroads or other business interests;

generally in the nature of a trust Late in the 19th century it became common in the United States for a group of corporations, which it was desired to bring together for monopolizing an industry, to "merge" by forming a holding company, which took over the majority stock of each subsidiary company in the meiger and gave in exchange the stock of the holding company. To test the validity of such mergers a suit was brought against the Northern Securities Company, and after exhaustive arguments and much delay the United States Supreme Court declared that the procedure was "in restraint of trade. Since then corporation mergers have ceased. The principle still holds good, however, in both civil and criminal law, that the lesser may merge into the greater contracts the acceptance of a high grade of security is held to extinguish the lower grade When a bond is given for the performance of a contract the obligation to fulfil the contract is merged in the bond as the higher obligation See TRUSTS

MERGUI (mer-ge') ARCHIPELAGO, a chain of islands in the Bay of Bengal, off the coast of Tenasserim in Burma, the more northem ones forming a paut of the British district of Mergur; area, 10,000 square miles. They are generally covered with trees and present many picturesque leatures, rising at some points to the height of 3,000 feet. The largest island is Kings Island, some 25 miles long. Some time is found here. The chief town is Mergur, with a population of about 15,000. The locality is one of the dampest on the globe, the rainfall exceeding 100 inches annually. The inhabitants belong to a race called Selungo. They give little attention to agriculture, obtaining a sustenance mainly by fishing, pearl gathering and selling edible birds' nests. The Sclungs are peaceful and industrious, but few in number. The adjoining seas abound in fish and excellent oysters; pearls of good quality are found. Pop. about 135,000.

MERIDA, Mexico, the capital city of Yucatan. The city was founded in 1542 and is situated on a plain. There are railway connections with all important points in the intenor and several lines of steamers ply between its port, Progreso, 25 miles distant, and Vera Cruz, New York and other prominent commercial ports The surrounding country is almost entirely devoted to the sisal hemp industry, which has reached enormous proportions in the state Hides, sugar, chicle and indigo are also exported. There are manufactories of cotton goods, cigars, panama hats, leather, soap, etc. The principal buildings are the government palace, the municipal palace, the Casa del Conquistador Montejo (the first Spanish house built in the city), the old cathedral, the School of Arts, the Penitentiary, Literary Institute or State College, Normal School for Teachers, Meteorological and Astronomical Observatory, Tucatan Museum, Catholic College of San Ildefonso, schools of medicine, surgery, pharmacy, jurisprudence and notarial instruction, the Literary Institute for Girls, the College for Girls, the Catholic School for Girls, the Tereseano College, the Primary School of Arts and Works and the Institucion de Beneficiencia Privado, founded by Leandro L. Ayala at an outlay of \$1,000,000. There are

an asylum for maniacs, a lazareto, a maternity hospital, three other hospitals, an asylum for mendigos, two theatres and an arena for bull fights The Hidalgo Paik contains a statue of Gen Cepeda Peraza, and one symbolizing the peace of the state. Near the great cathedral are also large statues of Saint Peter and Saint Paul A body of public security, a jefe politico and an inspector-general preserve order and ensure safety to all. The streets are paved with asphalt Merida contains two local financial institutions—the Banco Yucateca, with a capital of \$8,000,000, and the Banco Mercantil de Yucatan, with a capital of \$6,000,000, and a braich of the National Bank and an agency of the Bank of London and Mexico. Pop about 79,000.

MERIDA, Spain (the Roman Augusta Emerita), a small decayed town of the province of Estremadura, on the Guadana, 32 miles east of Badajoz. It is unique in Spain, and is in some points a rival of Rome itself on account of the number and magnitude of its remains of Roman antiquity. The Guadiana is here crossed by a Roman bridge of 64 arches (originally 81; 17 destroyed in 1812) and with a length of 2,575 feet and a breadth of 26 feet; it was erected by Trajan. There is another Roman bridge over the Albarregas, 450 feet long, 25 feet wide, still quite perfect, in spite of the traffic of 18 centuries since its erection. There are also remains of a castle built by the Romans, and among other most noteworthy monuments of antiquity are an old half-Roman, half-Moorish palace, the Casa de los Corvos, constructed out of a temple dedicated to Diana, several aqueducts, an ancient amphitheatre and a circus. Merida was founded in 23 BC, and flourished in great splendor under Roman and Moor until 1228, when it was taken from the Moors, after which it began to decline Pop. 15,000.

MERIDA, Venezuela, town, capital of the state of Merida, 5,290 feet above sea level, 60 miles south of Lake Maracaibo, at the foot of the Sierra Nevada de Merida, which tower to a height of about 15,000 feet It was founded in 1558 by Juan Rodriguez Saurez. It was almost wholly destroyed by an earthquake in 1812 and again seriously damaged in 1894. It is the seat of a bishop, contains a fine cathedral, one of the two national universities of Venezuela, and has several high schools. Its manufactures are carpets, woolen and cotton goods. Pop. about 15,000.

MERIDEN, Conn., city in New Haven County, alt. 190 feet, about 18m. SW. of Hartford, on the New York, New Haven and Hartford Railroad, and modern highways. It is the industrial center of a truck farming area, has brass and iron foundries, and manufactures plated and sterling silverware, ball bearings, lighting fixtures, plastics, carburetors, oil filters, household appliances, telephones and signals, hardware, and airplane accessories. The silver industry, for which the city is noted, developed from its pewter button and tin shops of the late 18th century. The manufacture of Brittania ware was begun in 1808, and in 1852 numerous small plants combined to form the Meriden Brittania Company. In 1857 this company bought the Rogers plant in Hartford where, in 1847, the Rogers brothers had discovered a

MERIDIAN

successful method of plating other metals with silver by electrolysis (See Electropiating) They came to Menden to manage the local company, and in 1898 it combined with several others to form the International Silver Company. The city was the home of Ella Wheeler Wilcox (qv) for many years, and is the child-hood home of Rosa and Caimella Ponselle, Metropolitan Opera stars. The state reform school for boys is located here. Settled in 1605 and named for the English home of an early landed proprietor, it was incorporated as a town in 1806, as a city in 1867, and consolidated in 1922. It has a mayor and council, and a municipally owned water supply and airport. Pop. (1930) 38,481; (1940) 39,494.

MERIDIAN, Miss, city and Lauderdale County seat; all 311 feet, on the Southern (Alabama Great Southern, New Orleans and Northeastern); Gulf, Mobile and Ohio; and Illinois Central railroads; 90m E. of Jackson It has an airport with airline service. The region about the city comprises areas of forests and of tertile farmlands which produce cotton, corn, sweet potatoes, beans, peas; strawberries, peaches, melons, figs; and pecars. The torests are of poplar, ash, magnolia, gum, lickory, and oak. In the city there are extensive railroad shops, lumber mills, cotton guis and cottonseed oil mills, and brick and cement plants. The Meridian factories produce hosiery and shuts. In connection with the lumber industry, wallboard is manufactured. After being destroyed by fire in the Civil War, then rebuilt, Mendan was distinctively a railroad town. In the 1890's it entered the industrial phase of its development, and agriculture held a place of secondary importance. But in the 1930's farming began to revive, and Meridian acquired a better balance of these various interests. The town has a public library. In the school system separate provision is made for white and colored students. The city is the seat of the East Mississippi Insane Hospital Interesting points are the arboretum in Highland Park, the grave of a gypsy «queen» in Rose Hill Cemetery, the civic center, and the Scottish Rite Cathedral The state fair and dairy show is held at Mendian in the fall; a college athletic event at the stadium, on Thanksgiving Day; and Confederate Memorial Day is publicly observed, in April Meridian has commission form of government, and a city-owned water supply system. Pop. (1930) 31,954;

(1940) 35,481. Consult 'Mississippi' A Guide to the Magnolia State' (New York 1938).

MERIDIAN (Miss), Expedition to. In January 1864 General Sherman concentrated two divisions of 10,000 each at Vicksburg under Generals McPherson and Hurlbut, and 3 February marched castward with the purpose of destroying Meridian, 150 miles distant, as a rail-toad centre, and possibly penetrating to Selma, Ala., or, if the opposing forces did not seem too strong at Mobile, to turn southward from Meridian and attempt the capture of that city. Gen. Sooy Smith was to co-operate with a cavalry force from Memphis; General Dodge, in command at Pulaski, Tenn., was to hold Logan at Bellefonte, Ala., for a diversion toward Rome, Ga.; and General Thomas was to demonstrate toward Dalton to prevent troops being sent by General Johnston to Sherman's front. Sherman entered Jackson on the 6th,

after heavy skirmishing with cavalry. Decatur was reached on the 12th. Meridian was taken the 14th, the Confederate force, under Gen. Leonidas Polk, being much less than Sheiman's, withdrawing toward Demopolis The aisenal extensive storchouses and cantonments were burned. The work of destroying the radroads centring at Meridian began on the 16th, 60 miles being rendered utterly useless to the north and east and 55 miles toward Mobile This destruction was of the most systematic and thorough character, 10,000 men worked at it for five days, of bridges and culverts and more than a mile of trestles over swamps were burned; all rails were rendered useless. This object of the expedition was fully gained, as Mendian was not wholly restored as a railroad centre during the war. Thereafter, the transporting of supplies eastward from the State of Mississippi was seriously interrupted for a long time and was greatly impeded up to the close of the war, while all military operations which required railroad facilities were rendered extremely difficult

The expedition, however, was not as successful as had been hoped. The Confederates, by the exercise of great energy in the face of many difficulties, so strengthened Mobile as to forbid an advance in that direction. Sherman, not receiving the cavalry support under Gen. Sooy Smith which he had reason to expect from Memphis, was unable to push on to Selma. Ala, one of the great manufacturing cities and storehouses for military supplies of the Confederacy Smith, in turn, had been unavoidably detained, and Sherman returned to Vicksburg, reaching its vicinity 26 February Ilis command had marched between 300 and 400 miles. had crossed Mississippi and inflicted well-nigh irreparable military damage, but had been prevented from carrying out his full program by Confederate activity in assembling forces in his extreme front.

MERIDIAN, one of the imaginary north and south lines on the surface of the earth that may be conceived of as passing through both poles and serving to indicate the longitude of places, and with a parallel of latitude mark their exact position. If one conceive the earth sliced into on one of these lines, the resulting surface is the plane of the meridian. There are also corresponding lines called astronomical or celestial meridian, which are imaginary circles of the celestial sphere passing through the poles of the heavens and the zenith of any place on the earth's surface. These correspond exactly to the geographical meridians, that is, the celestial is exactly above the geographical meridian of any place. Every place on the globe has its meridian, and when the sun arrives at this line it is noon or midday, whence the name (Latin, meridianus — medius, middle, and dies, day). (See Longitude). The inconvenience arising from having a fixed meridian in different countries is sufficiently obvious, and geographers, navigators and astronomers have all found it frequently a source of confusion After years of finitless discussion the question of a reference or first meridian for the world came before an international conference held at Washington, 1 to 22 Oct. 1884. There, although the representatives of France and Brazil dissented, it was agreed to recommend

the meridian of Greenwich both as the astronomical and as the geographical reference mendan of the world, longitude to be reck-oned east and west from this up to 180° At the same time it was advised that the astronomical day should begin at midnight, mean Greenwich time, the hours for astronomical purposes being reckoned as before from 0 to 24 This arrangement began on 1 Jan. 1885. Pieviously many foreign map-makers had accepted the meridian of Greenwich as first meridian, Germans and Americans apparently having no realousy of Great Britain in regard to the matter. The change of time has had some importance for astronomers, but ordinary civil time is still computed much as before The zone system of reckoning standard time was adopted in the United States in 1883 and in Australia in 1895 In the former country there are four zones the Eastern, taking time there are four zones the Eastern, taking time from the meridian of 75° W. (5 hrs. slow on Greenwich time); the Central, with standard meridian 90° W. (6 hrs. slow); the Mountain, 105° W (7 hrs. slow); and the Pacific, 120° W. (8 hrs. slow). There are three Australian transfer of County and Mark South Webs. Victor zones: Queensland, New South Wales, Victoria and Tasmania, with 150° E (10 his fast) as standard; South Australia, with 135° E (9 hrs. fast); and Western Australia, with 120° (9 hrs. fast); and Western Australia, with 120° E. (8 hrs. fast). Other standards adopted with reference to Greenwith are 15° E. (1 hr. fast) for Mid-Europe; 22½° E. (1½ hrs. fast) for Cape Colony, 30° E. (2 hrs. fast) for Natal; 135° E. (9 hrs. fast) for Japan; and 172½° E. (11½ hrs. fast) for New Zealand. The meridian is also applied to the laying out of the earth, magnetism on a chart, porth and south earth, magnetism on a chart, north and south line cutting the magnetic pole, or the vertical plane formed by such line is a magnetic mend-Consult any map for the meridian lines.

MERIDIAN CIRCLE, in astronomy, an instrument used in observatories to combine the functions of a transit instrument and of the old mural circle. It has a telescope mounted to turn in a circle, always in the plane of a meridian. Of course the axis must be accurately laid east and west, and for this purpose solid masonly piers are commonly provided. A vertical circle is carried on the axis of the transit instrument and revolves with it, its divisions being read by micrometer microscopes mounted solidly on one of the piers. In this way both coordinates of the position of a heavenly body, its right ascension and declination, are determined at the same meridian passage—a great saving of time over the old method with the instruments. See Telescope

MÉRIMÉE, mā-rē-mā, Prosper, French author: h Paris, 28 Sept. 1803; d. Cannes, 23 Sept. 1870. He was educated at the Collège Henn IV and studied law though he never practised it. Under the pseudonym "Joseph Lestrange" he published in 1825 'Theatre de Clara Gozul, Comedienne Espagnole,' an assumed translation from the Spanish of eight prose comedies, but in reality his own work. From that time onward he continued to publish works at frequent intervals and at the same time had an official career of importance. Following the revolution of July 1830, he was made secretary to the ministers of commerce and marine, in 1831 was appointed inspector of ancient monuments, in 1844 became a member

of the Academy, and senator of France in 1853. He was a commander of the Legion of Honor in 1860. Beside publishing several important works connected with his duties as inspector of ancient monuments he was the author of 'Colomba' (1840), a very popular novel of the Corsican vendetta; 'Carmen' (1847), a romance upon which the famous opera 'Carmen' by Bizet is founded; 'Lettres à une Inconnue,' his most famous work (1873); 'Lettres à une autre Inconnue' (1875); 'Lettres à Panizzi' (1881); 'Une Correspondance Inédite' (1896). The four works last named are Mérimée's most characteristic writings revealing him as a most loyal devoted friend They differ widely from his other works, which though often brilliant are hard and unsympathetic, while these are tender and romantic As a master of style Mérimée had few equals in his day (See Carmen's Colomba') Consult Filon, 'Mérimée et (1888); Tourneux, 'Prosper Mérimée, ses Portraits, ses Dessins, etc' (1879).

MERINO, a woolen or worsted fabric, introduced about 1826, and so named because made from the wool of merino sheep The word is originally the title of an inspector of sheep pastures in Spain, and became attached to the short-wool Spanish sheep. The breed did not originate there, however, being imported from Africa by the Moors and bred by the Spanish The wool was so highly regarded that they have been exported for breeding all over the world, but especially to Australia See Wool, Manufacture of

MERINO SHEEP. See SHEEP.

MERIT, Order of, a British order instituted by King Edward VII, 26 June 1902, to confer distinction on persons in military, scientific, artistic and professional circles The number of British members is limited to 24 Certain foreign persons of eminence are appointed by the sovereign.

MERIT SYSTEM, The. See Civil Service Reform.

MERIVALE, měr'í-vāl, Charles, English historian and ecclesiastic: b. Barton Place, Devonshire, 8 March 1808; d Ely, 27 Dec. 1893. He was educated at Cambridge, took orders in the English Church, was rector of Lawford, Essex, 1848-69, and dean of Ely from 1869. He published 'The Fall of the Roman Republic' (1853), which forms the first part of his popular 'History of the Romans under the Empire' (latest ed, 1890); 'General History of Rome' (1875); 'Lectures on Early Church History' (1879); etc. Consult 'Autobiography and Letters' edited by his daughter (1899).

MERIVALE, Herman, English statesman and political economist; brother of Charles; b. Dawlish, Devonshire, 8 Nov. 1806; d London, 9 Feb. 1874. He was educated at Oxford, where he was professor of political economy 1837-42. He was under-secretary for the colonies, 1848-59, becoming perpetual under-secretary for India in 1859. He wrote 'Colonization and Colonies' (1841), a much valued work; '(Historical Studies' (1865); 'Memoirs of Sir Philip Francis' (1867).

MERIVALE, Herman Charles, English author: b. London, 1839; d. 15 Jan. 1906. He

was educated at Harrow and Oxford, became a barrister of the liner Temple in 1861 and edited the 'Annual Register' 1870-80 Among his publications are 'The White Pilgrim and Other Poems' (1875); 'The Cynic' (1882); several plays; 'The Whip Hand' (1884); 'The Dove' (1888). He was a son of J. H. Merivale.

MERIWETHER, Lee, American lawyer, social reformer and author; b Columbus, Miss, 25 Dec 1862. Having obtained a secondary education at Memphis, Tenn, he there published the Free Trader with a brother, Avery, in 1881–83, and in 1885–86 toured burope aloof from Gibialtar to the Bosporus for study of the condition of Continental workingmen and of the protective tariff. In 1910, on the 25th anniversary of this "Tramp" trip through Europe, he covered the same route in an automobile; the contrast between walking and motoring abroad, and the changes that had taken place in the manners and customs of the peoples of Europe between 1885 and 1910 were interestingly set forth in a book entitled 'Seeing Europe By Automobile' (New York 1911). He was appointed by the Secretary of the Interior to write for the United States Labor Bureau a report on the 'Condition of European Labor,' published in the annual report of the bureau for 1886. In 1886-89 he was employed as a special agent of the Department of the Interior for which he made investigations of labor in the United States and the Hawaiian Islands, and in 1891 visited the island prisons of the Mediterranean. He was admitted to the bar in 1892, and in 1893 entered practice at Saint Louis. In 1889-90 and 1895-96 he was labor commissioner of Missouri. His reports on municipal government and street-railway franchises led to his nomination in 1897 for the mayoralty of Saint Louis on the Democratic ticket. He was defeated at that time and also in 1901, when he was candidate of the Public Ownership party. Besides his various reports, he has published 'A Tramp Trip: How to See Europe on Fifty Cents a Day' (1887); 'The Tramp at Home' (1890); 'Afloat and Ashore on the Mediterranean' (1892); 'Miss Chunk' (1899); 'A Lord's Courtship' (1900); 'Seeing Europe by Automobile' (1911); 'War Diary of a Diplomat' (1919), etc.

MERLE D'AUBIGNE, Jean Henri. Sce D'AUBIGNÉ, JEAN HENRI MERLE.

MERLIN, merlin, a semi-legendary British prophet and magician, supposed to have flourished toward the end of the 5th century. The accounts of him are hopelessly mixed with fiction. He was said to be the son of a demon and the daughter of a British prince, and was brought up at Caer-Merlin, a city supposed to be the modern Carmarthen. He received from his father the power of working miracles and was the greatest sage of his time, the counsellor and friend of English kings. Vortigen, according to the legend, on the advice of his magicians, had resolved to build an impregnable tower for security against the Saxons but the foundation was scarcely laid when the earth opened by night and swallowed it up. The magicians informed the king that to give firmness to the foundation he must wet it with the blood of a child born without a father. After much search the young Merlin was brought to

the king. Merlin disputed with the magicians and showed them that under the foundation of the tower was a great lake, and under the lake two great raging dragons, one red, representing the British, one white, representing the British, one white, representing the British, one white, representing the Saxons. The earth was dug open, and the dragons began a lurious battle; whereupon Merlin wept, and uttered prophecies respecting the future state of Empland. Merlin is a character in Tennyson's 'Idylls of the King.' A collection of the prophecies attributed to him appeared in Paris in 1998, at London in 1529 and 1533, at Venice, 1554. They can be traced back to about 1300. His prophecies were published at Edinburch in 1615 and contain also those ascribed to the Cambrian or Welsh Merlin. Consult Child, 'Her Book of Merlin', (New York 1904); Tennyson, Alfred, 'Idylls of the King.'

MERLIN. This dramatic narrative poem by Edwin Arlington Robinson is among the most distinguished and significant products of recent American literature, and bids fair to take its place beside the best of its very admirable kind. It is entirely modern in its spirit and treatment, with lines like these that mark its date:

"A mighty scythe, and some day all your peace" Goes down before its edge like so much clover"

In Mr. Robinson's poem King Arthur and his kinglits are not tomaintic heroes, as other poets have made them, not "our conception of what kinglithood should be"; they are a modern poet's conception of what leaders of men always and universally are, king, warrior, lover, fool; Arthur, Gawaine, Lancelot, Dagonet Nor is Mr. Robinson's Merlin like Tempson's a magician in his dotage falling a victim to the wiles of a talse woman. He is a prophet whose "memories go forward"; he is a man "Who saw himself, A sight no other man has ever seen," and he follows Vivian, "a woman who is worth a grave," because Fate wills it so. It is not the age of chivalry but our own time, our own double world of hope and of reality, with its loves, faith, fears, wars and failures that Mr. Robinson revivifies in "Merlin." The philosophy of the poem, that faith and creative love will someday save the world, is a lustrous background for the story: "The torch of woman, who, together with the light That Galahad found, is yet to light the world." As a tale Merlin is vivid and compelling, with scenes, like that of Merlin's first meeting with Vivian and his final parting, which rival the best in drama for beauty and intensity.

Edital Fallows

MERLIN, or STONE-FALCON, a small and handsome European falcon (Asalon reaulus) prevailingly blue, known throughout the temperate parts of the old world, and very similar to the American pigeon-hawk (qv.). It is fierce and courageous, and is trained in falcony for the pursuit of the birds that form its natural prey.

MERMAID, a mythical being living within and under the sea, having the form of a woman above the waist and that of a fish below it. They are usually described as having great personal charms, and as using these for the purpose of luring imaginative and amorous men to

destruction by enticing them into the depths of the sea; and, as a correlative, they are sometimes represented as securing their own destruction by quitting the sea, through marriage with some favored human husband by which they magically obtain temporarily a complete human form and soul, but always end in bringing disaster to one or both of the sacrifegious pair. Mermen are also occasionally heard of, but take an unimportant part in the legendary lore of the sea

This mediavial notion is doubtless a survival of the primitive fauctes, half fearful, half poetic, which created the classic conceptions of titions, nereds, and the like Shakespeare wrote (Ant. and Cleop, II, 2, 211):

"Her gentlewomen, like the Nereides, So many mermaids, tended her"

All of these ideas probably arose from a mixture of observed human resemblances in certain marine animals with purely mystical fancies which peopled the ocean with similitudes to terrestrial creatures. Primitive men have everywhere derived a large part of their sustenance from the natural products of the waters; and always the vastness and mystery of the sea, full of strange creatures and incompichensible phenomena, have powerfully affected the imagination of the ignorant and super-To this day the ocean is more familiar stitious and more important in the life of many isolated peoples, who dwell upon its margin and derive their support almost exclusively from it, than is the land; and they invest it and everything it contains with a wondering regard which the inlander can neither share nor understand. To these, even in civilized regions (as on the coast of Ireland or the ITebrides) mermaids remain only one of many present realities, herding sea-cattle and lying in wait for unwary humanity as surely as when sea-horses raced over the Ægean waves with the car of Poseidon or the Sirens tempted the manners of ancient Greece. In one form or another such stories have been rife in the folk-lore of all maritime peoples since prehistoric times; and, although not so widespread, the belief in mermaids, and their kith and kin, is still a matter of firm faith with hosts of persons in all parts of the would Folk-lore abounds in evidence of this.

The physical basis for these notions rests upon the resemblance which some marine animals bear to human beings when seen at a distance and in certain attitudes Such, in northern countries, are various seals, which formerly abounded upon the coasts of western Europe and still are to be seen in the less frequented spots. They have a way of lifting their round heads and shoulders from the water, with a queer human intelligent look upon their faces, and hugging their young to their bosoms with motherly affection. Impressed with this resemblance, easily turned into a story to beguile a long winter evening or to amuse a child, and growing with imaginative repetitions, the northern peoples were quick to believe the similar and more elaborate stories brought to them by early voyagers from the Mediterranean, and so the tales grew and changed into the rich folk-

lore of the coasts of the North Sea.

The southern stories, embellished by classic culture into the sea-myths of Neptune, Proteus and the sea-nymphs of old, and descending into the mermaids and mermen of mediæval

folk-lore, yet alive around the Mediterranean and Oriental seas, and among sailors generally, probably have their root in the aspect of the East Indian and African dugongs (qv) Near at hand these uncouth monsters would never be mistaken for human beings, but seen at a distance, by fearful and wondering voyages along the coast, such an error might easily happen, for they frequently stand upright among the weedy shallows of the coasts, perhaps draped with loosened vegetation like long hair, and holding to their breasts a young one who nurses from pectoral mammæ much as a human baby would do. Such reports, brought back to the enquiring poetic minds of Greece, might easily blossom into the tales of sea-mythology which formed so laige and ical a part of the popular belief as well as of the legendary lore of the classic age of India, Persia and the Mediterranean peoples The fish-gods of the Phænicians and other idolaters are closely related

From this has come down to us the extensive and varied use of mermaids and mermen in heraldry. "In French heialdry," says Robinson, "the mermaid is called the Siien, in German she has two tails; in the Italian she cairies a harp; and in many cases in each country she is crowned. In England it is a very ancient crest, and among others the lords Byron, the cails of Portsmouth. . and many others display the sea-maiden in their armorial bearing. With her comb and looking-glass she smiles at us from the shields of the Holmes, Ellises, Lapps; and as a supporter holds up the arms of the Viscounts Boyne and Hood, the cails of Howth and Caledon, and is borne by the heads of the families of Sinclair of Rosslyn, and Scott of Harden. Two mermaids crowned are the supporters of the Boston arms."

Artificial mermaids, claiming to be preserved realities, have formed a part of the stock of curiosities of wonder-shows since time immemorial; and most of those exhibited since the days of Barnum have been the products of Japanese ingenuity.

ERNEST INGERSOLL

MERMAID'S HEAD, a globose seaurchin, as one of the heart-urchins.

MERMAID'S PURSE, the egg-case of the skate (or shark), which is often cast up empty on the shore.

MERMAN. See MERMAID.

MERO, or MEROU, a West Indian name for a jewfish (q v).

MEROBAUDES, Flavius, a Spanish rhetorician and poet of the first half of the 5th century AD, eminent also as a general, has left us a short hymn in honor of Christ and fragments of five historical poems. L Jeep in his edition of Claudian (Leipzig 1876-79) publishes four of these poems.

MERODACH, měr'ō-dăk, or BEL-MERODACH. See BEL

MEROÉ, měr'ō-ē, Egyptian Sudan, a city and state of ancient Ethiopia, in the northeastern part of Africa. The city is still represented by ruins and pyramids near Kabati on the Nile north of Khartum and the state forms the district often spoken of as the Isle of Meroë, extending southeast to Abyssinia, and in the

northwest forming a part of Nubia. It was distinguished for its mineral and cereal wealth and at an early date was the centre of an active and varied commerce including the great caravan trade between Ethiopia, Egypt, Atabia, northein Africa and India. The government was in the hands of a caste of priests, who chose a king who was obliged to live and act according to certain prescribed rules. priests could sentence the king to death in the name of the gods, and he was forced to sub-nut. The priests were of a lighter complexion than the other inhabitants and may have come from India. Ergamenes, king of Meroe in the 3d century BC, during the reign of Ptolemy II in Egypt, first made himself independent of this oppressive priesthood by murdering the priests in the golden temple Meroe and Axum (in Abyssinia), which appears to have been a colony of Meroe, remained the centre of the southern commerce till the time of the Arabians The existing monuments of their architecture, and many other vestiges, exhibit an advanced religious and social cultivation. The University of Liverpool in 1910-11 financed excavations here, interesting ruins were uncovered and many valued relics obtained. Consult Budge, 'The Egyptian Sudan' (London 1907)

MEROPE, the title of an Italian tragedy in blank verse by the Marquis Francisco Sciptione Matter (1675-1755), first performed at Modena in 1713. Appearing just after the dreary period of 17th century stagnation in Italian letters, it obtained a European reputation. More than 60 editions were published and it was widely translated. It attained in Italy an unprecedented success on the stage and is important also for its influence upon the development of the Italian theatre, whose standard

Maffer raised perceptibly.

The subject of the play is taken from Greek mythology as related by Apollodoro (II, 8-5) and Pausanias (IV, 3-6). Merope is the queen of Messena whose husband, Cresfonte, and two children have been murdered by her brotherm-law, Polifonte, who then usurps the royal power and attempts to force the queen to marry him. On this tragic story Euripides wrote his 'Cressonte,' which is not extant. Massei was the first modern dramatist to handle the material and reveal its superb possibilities. He dispenses with the love element so prevalent at that time in the French theatre and proves that without it a play can retain the in-terest of the spectator. His idea is that such a play shall depict but a single passion, in this case a mother's love for her son. The scene (III, 4) in which Merope, believing that she has in her grasp her son's slayer, discovers in him her own son, the transition from anger and vengeance to surprise and then to the motherly love, is profoundly impressive. The dénouement, the death of the tyrant (V, 6), at the foot of the altar, is equally effective Notable as are the tragedies of Voltaire and of Alfieri dealing with the same subject with the power characteristic of each of these master minds, nevertheless in intensity of plot interest and in dramatic treatment, Massei's 'Merope' remains unsurpassed Consult 'Opuscoli e lettere di Maffei' (Milan 1844), for the text and interesting material. A school edition, edited by A. C. Clapin was published in London in 1800. The text, with variations and introduction, appeated later in No. 108 of the 'Bibliotheca Romanica'

JAMES GEDDES, JR.

MEROSTOMATA, a sub-class of arthropods, allied to the Crustacea, and represented by only a single survivor (the horseloot ciab), but including a large series of fossil forms which flourished in the Palæozoic Age from mid-Cambrian onward. They were somewhat scorpion-like in torm, although sometimes of gigantic size, and ranked between the superior tillobites and interior arachinds. The Meiostomata are characterized by having six pairs of ambulatory limbs about the mouth, the hist of which terminate in some, it not in all, cases in chilicene. The others serve as organs of locomotion, and then coxal joints for prehension and mastication. The prevailing opinion is that the body is divided into two parts (cephalothorax and abdomen) instead of three (headshield, thorax and abdomen) has been changed by recent discoveries that make the tillobate character of the structure indubitable, and establish a close relationship with the trilobites The sub-class comprises three orders, Xiphosura, the horsefoot crabe (qv), several species of which still exist, the Synaphosura, Silurian and Cambrian tossil forms; and Emplerida (see Euryptirus). Consult Packard, Zoology) (1807), and Zittel-leastman, 'Textbook of Paleontology' (Vol. 1, 1900), which contains an extensive bibliography

MEROVINGIANS, mer-o-vin'ji-anz, the first dynasty of Frankish kings which ruled in the northern part of Gaul, since called France. They derived their name from Merowig (Merovens), the grandlather of Clovis. They ruled from 400 fill 752, when they were supplanted by the Carlovingians. Pepin the Short caused the overthrow by deposing Childeric III, and sending him to a monastery.

MERRELL, John Porter, American naval officer. b Auburn, N. Y. 7 Sept. 1846; d New London, Conn., 8 Dec. 1916. He was graduated at the United States Naval Academy in 1867, served with the European fleet 1867-70; was on signal duty on the Washington and Darien expedition of 1870-71, was in charge of the naval ordinance proving grounds 1877-79. He was also for a time an instructor at Annapolis and had command of the Atlantic fleet. He also did active work in the Department at Washington. He was retired by operation of law 7 Sept. 1908. In 1895-96 he was a member of the State Department Commission to investigate anti-foreign riots in the province of Szechuen, China.

MERRIAM, Augustus Chapman, American classical scholar. b Locust Grove, N. Y., 1843; d. Athens, Greece, 1895. He was graduated at Columbia University in 1866 and after 1868 was connected with that institution successively as tutor, adjunct professor of Greek, and professor of Greek archaeology and eggraphy. Dr. Merriam did much to promote the study of classical archaeology in the United States. In 1887-88 he was director of the American School at Athens. He published 'The Phaeacians of Homer' (1880); 'The Greek and Latin Inscriptions on the Obelisk Crab in Central Park' (1883); 'The Sixth and Seventh Books of Herodotus' (1885); 'The

Law Code of Gortyna in Crete? (1886); 'Telegraphy among the Ancients' (in Papers of the Archeological Institute of America: Classical Series III, Cambridge 1890).

MERRIAM, C(linton) Hart, American naturalist: b New York City, 5 Dec 1855, d. Berkeley, Calif, 19 March 1942. He studied at Sheffield Scientific School, Yale University, 1874-77, and was graduated from the College of Physicians and Surgeons (Columbia University) in 1879. He practiced medicine, 1879-85, and then served as chief of the United States Biological Survey (now the Fish and Wild Life Service), 1885-1910, resigning to conduct biological and ethnological investigations under a special trust fund established by Mrs. F. H. Harriman, which work he carried on until 1939. He served the federal government in numerous capacities, and in 1891 was Bering Sea commissioner when he made a study of the seals on Pribilof Islands. He was a member of numerous scientific organizations and wrote many books and papers including. Birds of Connecticuti (1877); 'Manimals of the Adirondacks' (1882-84), 'Life Zones and Grop Zones of the United States' (1898); 'Review of the Grizzly and Big Brown Beaus of America' (1917), 'The Buffalo in Northern California' (1926); 'William Healy Dall' (1927).

MERRIAM, Henry Clay, American soldier: b Houlton, Me., 13 Nov. 1837; d 1912. He was graduated from Colby University, and began the study of law; but in 1862 entered the Union army as captain in a Maine regiment. He was at the battle of Antietam in 1862, and organized the colored troops in 1863, being heutenant-colonel of the Louisiana Native Guard (a negro regiment) at the close of the war; he led the assault on Fort Blakely 9 April 1865, and obtained a medal of honor from Congress for gallant conduct. In 1866 he was appointed major in the regular United States army, and rose to the rank of brigadier-general in 1897 and major-general of volunteers in the Spanish War, 1898. He served in many expeditions against the Indians, and protected American citizens in the valley of the Rio Grande in the revolutionary troubles (1873-76). In 1898 he was commander of the departments of the Columbia and California, and organized, equipped and forwarded the troops to Philippines; and in 1899 was sent to the Philippines in command of the army of occupation. In January 1900 he was placed in command of the Department of the Colorado, and in 1901 was retired from active service. He was the inventor of the Merriam infantry pack.

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MERRIAM, John Campbell, American educator and paleontologist: b. Hopkinton, Iowa, 20 Oct. 1869. In 1887 he was graduated at Lenox College, Iowa, and in 1893 received the degree of Ph.D. at the University of Munich. In 1894-99 he was instructor in paleontology and historical geology; in 1899-1905 assistant professor; in 1905-20 associate professor, and professor of paleontology at the University of California and in 1920 became president of Carnegie Institute. Professor Mernam was a Fellow of the American Association for the Advancement of Science, of the American Paleontological Society, and other learned bodies He was the author of numerous papers on fossil reptiles, fossil mammals and general historical geology. D. Oakland, Calif., Oct. 30, 1945.

MERRIAM, William Rush, American financier: b. Wadham's Mills, N. Y., July 1849. He was graduated from Racine College, Wisconsin, in 1871 and entered the First National Bank of Saint Paul where he was cashier in 1873. In 1880 he was president of the Merchants' National Bank there and in 1882 became a member of the State legislature of Minnesota and was speaker in 1886. He was elected governor of Minnesota in 1889; director of the U S. Census, 1898–1903. D. 18 Feb. 1931.

MERRICK, Leonard, English author: b. Belsize Park, London, 21 Fcb 1864. He was educated at Brighton College, and in private schools. Within recent years his books have attained wide popularity, especially his short stories, which show much originality. In 1918 his works were reissued in collected form, with introductions by some of the most famous writers of the day. The list follows, with the names of those who wrote the introductions given in brackets 'Conrad in Quest of His Youth' (Sir J M Barrie), 'When Love Flies Out o' the Window' (Sir W R Nicoll); 'The Position of Peggy Harper' (Sir Arthur Pinicro); 'The Man Who Understood Women' (W J Locke); 'The Quaint Companions' (H G Wells); 'Cynthia' (Maurice Hewlett); 'The Man Who Was Good' (J K. Prothero), 'A Chair on the Boulevard' (A. N. Lyons); 'One Man's View' (Granville Barker); 'The Worldlings' (Neil Munro), 'The Actormanager' (W D Howells), 'The House of Lynch' (G K Chesterton) Other publications include 'While Paris Laughed,' 'To Tell You the Truth'; 'The Little Dog Laughed' (1930); and the plays 'The Free Pardon' (F C. Philips); 'When the Lamps are Lighted'; 'My Innocent Boy'; 'The Elixir of Youth'; 'A Woman in the Case' (with G. R. Sims). D. 7 Aug. 1939.

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MERRIFIELD, mer'i-feld, Webster, American educator: b Williamsville, Vt., 27 July 1854; d 22 Jan. 1916 He was graduated from Yale in 1877 and was an instructor there 1879-83. From 1884 to 1891 he was professor of Greek in the University of North Dakota, professor of political economy, 1891-1903, and president of the institution since 1891.

MERRILL, Elmer Truesdell, American university professor: b. Millville, Mass, 1 Jan. 1860. In 1881 he was graduated at Wesleyan University and subsequently studied at Yale, 1885–86, the University of Berlin, 1886–87, Rome 1892, 1895, 1898–99, 1903, and in England. In 1882–83 he was instructor in classics at the Massachusetts State Normal School, Westfield; in 1883–86 tutor in Latin at Wesleyan; in 1887–88 professor of Latin at the University of Southern California; in 1888–1905 Robert Rich professor of Latin language and literature at Wesleyan University. In 1905 he became professor of Latin language and literature at Trinity College, Hartford, and in 1908 was appointed professor of Latin at the University of Chicago. Dr Merrill was chairman of the American School of Classical Studies in Rome in 1900–01 and professor there in 1898–99. After 1906 he was associate editor of Classical Philology. He edited 'Poems of Catullus' (1893); 'Fragments of Roman Satire' (1897); 'Selected Letters of the Younger Pliny' (1903); 'Early Christian History' (1923). Died Santa Barbara, Calif., 20 April 1936.

MERRILL, Frederick James Hamilton, American geologist: b. New York, 30 April 1861; d. 29 Nov. 1916. In 1885 he was graduated at the Columbia School of Mines, received the degree of D.Ph there in 1890 and was assistant in the New Jersey Geological Survey 1885-89. In 1890-93 Dr. Merrill was assistant State Geologist of New York. In 1890-94 he was assistant director, in 1894-1904 director of the New York State Museum. He had charge of the New York exhibits at the expositions, Chicago, 1893, Buffalo 1901 and Saint Louis 1904. After 1904 he engaged in private practice as mining geologist. He published 'Salt and Gypsum Industries in New York' (1893), 'Mineral Resources of New York' (1896), 'Road Materials and Road Building in New York' (1897); 'Natural History Museums of the United States and Canada' (1903).

MERRILL, mer'il, George Edmands, American Baptist clergyman and educator: b. Charlestown, Mass, 19 Dec. 1846; d Hamilton, N. Y., 11 June 1908. He was graduated from Harvard in 1869, and from the Newton Theological Seminary in 1872. Entering the Baptist ministry, he was pastor at Springfield, Mass. (1872–77); at Salem, Mass. (1877-85); at Colorado Springs (1885-87); and at Newton, Mass. (1890–99). In 1890 he was called to the presidency of Colgate University, Hamilton, N. Y., where his administration improved the standard and awakened interest in many new lines of college activity. He wrote 'Story of the Manuscripts' (1881); 'Crusaders and Captives' (1890); 'The Reasonable Christ' (1893); 'The Parchments of Faith' (1895).

MERRILL, George Perkins, American geologist: b. Aubuun, Me., 31 May 1854. He was graduated at the University of Maine in 1879. He was head curator of the department of geology in the United States. National Museum 1887–1929, and professor of geology and mineralogy in George Washington University after 1893. He was special agent for the 12th census. He published 'Stone for Building and Decoration' (1891–1903), 'Rocks, rockweathering and Soils' (1897–1907); 'Handbook of the Department of Geology United States National Museum' (1892); 'Non-Metallic Minerals' (1901–04–10); 'History of North American Geology' (1905); 'Catalogue of Meteorite Collection in United States National Museum' (1915); 'Handbook of Geins and Prectous Stones' (with others, 1922), 'The First 100 Years of American Geology' (1924). Dr. Merrill was a member of numerous learned bodies. He died 15 Aug. 1929.

MERRILL, Lewis, American soldier: b. New Berlin, Pa., 28 Oct. 1834; d Philadelphia, 27 Feb 1896 He was graduated from West Point in 1855, and at the outbreak of the Civil War was appointed colonel of a volunteer cavalry regiment and served with distinction through the war. He was active in warfare with the Indians and performed the notable service of breaking up the Kukhux Klan in 1868, which was recognized by Congress after some delay by promotion to the rank of lieutenant-colonel of cavalry. He retired from active service in 1891.

MERRILL, Selah, American Congregationalist clergyman and archæologist: b Canton Centre, Conn., 2 May 1837; d. 1909. He

was educated at Yale and at the New Haven Theological Seminary and was ordained to the ministry in 1804 when he entered the Federal army as chaplan. He held pastorates in Leroy, N. Y., and in San Francisco, and was for a time professor of Hebrew at Andover Theological Seminary. In 1882-86, 1891–94 and after 1898 he served as United States consul at Jerusalem and made valuable archæological researches and discoveries there. In 1907 he became consul at Georgetown, Guiana. He wrote 'East of the Jordan' (1881), 'Galilee in the Time of Christ' (1881); 'The Site of Calvary' (1885), etc.

MERRILL, Stephen Mason, American Methodist bishop, b Jefferson County, Ohio, 16 Sept 1825, d Keyport, N. J., 12 Nov 1905. He studied for the ministry and was ordained by the Ohio Conference in 1846, and in 1868-72 was editor of the 'Western Christian Advocate.' In 1872 was appointed bishop. He published 'Christian Baptism'; 'Union of American Methodism'; 'Sanctification' (1901); 'Miracles' (1902)

MERRILL, William Emery, American military engineer. b Fort Howard, Wis., 11 Oct 1837; d near Edgefield, III, 14 Dec. 1891 He was graduated from West Point in 1859 and for a year prior to the outbreak of the Civil War was assistant professor in engineering at West Point He went to the front in 1861, and served with distinction at Yorktown, Chickamanga, Missionary Ridge and other famous battles and in 1804-05 had charge of the railroad which supplied the armies in Georgia and Tennessee and was brevetted colonel for his services. After the war he served as chief engineer on the staff of General Sherman and was engaged in western surveys and the improve-ment of rivers. He was in charge of the improvement of the Ohio River at the time of his death which occurred on a railroad train. He wrote Tron Truss Bridges for Railroads (1870) and Improvement of Non-Tidal Rivers' (1881).

MERRILL, Wis., city, Lincoln County seat, alt 1,203 feet, on the Wisconsin River, the Chicago, Milwaukee, St. Paul and Pacific Raihoad, and state and federal highways; by rail 19m. N. of Wansau. There is an airport. Merull is located in an old lumbering region. Its chief industrial products are shoes and paper; also, doors and sash, dairy products, and cauned foods. There is a public library. Pére René Menard, French priest had a mission here in 1601. The town, settled in 1875 under another name, received its charter as a city in 1883, and was then renamed. It has government by mayor and council. Pop. (1940) 8,711.

MERRIMAC, mer'i mak, a river of New Hampshire, which has its source at Franklin where the Penigewasset and Winnipisaukie rivers unite. The Winnipisaukie is the outlet for the lake of the same name; the Penigewasset has its rise in the northern part of Grafton County, in the White Mountains. The Merrimac flows nearly due south into the State of Massachusetts when it turns, continuing its course east, then northeast to the Atlantic Ocean. The mouth of the river is a tidal estudiately which is navigable for steamers of good size. At the entrance is a sand bar which is constantly changing, and which is a hindrance

to navigation. The river is navigable for small steamers as far as Haverhill. The extensive water-power of the Merrimae has been the main cause of the development and prosperity of the entire region. Some of the largest cotton-mills of the country were erected on its banks, and many wooden mills, carpet mills and other manufactories. Newburyport is at the mouth of the river. Other important places on its banks are Haverhill, Lawrence and Lowell, in Massachusetts, and Nashua, Manchester and Concord in New Hampshire. The length from the source of the Pemigewasset to the ocean is 183 miles, its dramage area 5,000 miles.

MERRIMAC, The, a fugate of the United States mavy. See Monitor and Merrimac, The

MERRIMAN, měi'ĭ-mạn, Henry Seton. See Scott, Hugh Stowell

MERRIMAN, Mansfield, American engineer: b Southington, Conn., 1848; d. 7 June 1925. He graduated from the scientific department at Yale in 1871, was with the United States Corps of Engineers for two years, and in 1875 became instructor in civil engineering at the Sheffield Scientific School (Yale) In 1878 he resigned to accept a position as professor of civil engineering at Lehigh University, which he occupied for 29 years. During a part of this period he was also called upon to assist the United States Coast and Geodetic Survey. After 1907 he devoted most of his time to consultation on important works, mainly in hydraulics He wrote many textbooks, widely used by the colleges. Among them are 'Method of Least Squares'; 'Mechanics of Materials', 'A Text Book on Roofs and Materials', 'A text book of Roots and Bridges' (4 vols., Jacob co-editor), 'Treatise on Hydraulics', 'Handbook for Surveyors'; 'Strength of Materials'; 'Precise Surveying'; 'Elements of Sanitary Engineering'; 'Elements of Hydraulics.' Every one of these has passed through several editions. He was also based editors of the American Engineers' Pocket chief editor of the 'American Engineers' Pocket Book, and contributed to numerous technical and scientific papers.

MERRITT, Ernest George, American physicist: b Indianapolis, Ind., 28 April 1865 In 1881–82 he studied at Purdue University and m 1886 was graduated ME at Cornell He made graduate studies at Cornell in 1887–88 and at the University of Berlin in 1893–94 In 1888–91 he was instructor in physics, in 1892–1903 assistant professor, and after 1903 professor and after 1918 head of the department at Cornell. From 1909 to 1914 he was dean of the Graduate School Dr. Merritt is a contributor to scientific journals on investigations in physics.

MERRITT, mer'it, Wesley, American soldier: b. New York, 16 June 1836; d. Washington, D. C., 3 Dec. 1910. He was graduated from West Point in 1860 and served with honor through the Civil War and for bravery at Gettysburg was brevetted major. His services at the battles of Yellow Tavern and Winchester gained for him the rank of brigadier-general and major-general. He was assigned chiefly to frontier duty from the close of the Civil War until 1882 when he was made superintendent of West Point and in 1887 placed on duty at Fort Leavenworth, Kan. He commanded the Department of the East, 1897-98 and

in May 1898 was put in command of the United States troops in the Philippines and conducted the campaign to a successful termination After the close of the Spanish-American War he was ordered to Paris in order to assist the work of the American peace commissioners. He was retired in June 1900.

MERRITT, William Hamilton, Canadian mining engineer. b. Saint Catherines, Ontario 1855; d Toronto, 1918 Educated at Upper Canada College, the Royal Military School, and the Royal School of Mines, London Returning to Canada he practised his profession in Toronto; was a member of the Canadian commission to the Paris Exposition of 1878 and subsequently was made lecturer in mining engineering in the Kingston School of Mining. He became a cornet in the governor-general's body-guard in 1884, took part in suppressing Riel's rebellion in 1885, in the Boer War in 1899–1902 Mr Merritt was also chosen president of the Ontario Mining Institute. He contributed to the 'Proceedings' of the London Geological Society, the 'Proceedings' of the American Institute of Mining Engineers; the 'Proceedings' of the Canadian Institute and published 'Economic Minerals of Ontario' (1896) and 'Field Testing for Gold and Silver' (1900).

MERRY, William Walter, English Anglican clergyman and classical scholar: b. Worcestershire, 6 Sept 1835 He was educated at Balliol College, Oxford, and was rector of Lincoln College there after 1884 He was widely known for his editions of the classics published by the Clarendon Press and including the 'Odyssey' (Books I to XII, 66th thousand; XIII to XXIV, 16th thousand); and the plays of Aristophanes. He also published 'The Greek Dialects' (1875). He died in 1918.

MERRY DEL VAL, Rafael, cardinal of the Roman Catholic Church: b London, 10 Oct. 1865. His father, Don Marquis Merry del Val was partly of Irish ancestry, being descended from the Irish family Merry established in Spain; and his mother, daughter of Don Pedro José de Zulueta, Count de Torré Diaz, although of Spanish origin, was English by education. At the time of Rafael's birth his father was secretary to the Spanish embassy, London, the boy's carly studies being pursued in the English metropolis. Later he attended the Jesuit College of Saint Michael, Brussels, afterward taking a course at Ushaw, and was subsequently chosen private tutor to Alfonso XIII. When his father was appointed Spanish Ambassador to the Vatican young Rafael accompanied him to Rome and entered the Gregorian University where, in preparation for the priesthood, he studied philosophy and theology, receiving the degree of doctor of philosophy and theology conferred by this institution. At the age of 24 he was ordained a priest and, although intended for the diocese of Westminster, was retained in Rome and soon became cameriere participante to Pope Leo XIII Four years later he was appointed master of the robes and privy chamberlain to Leo XIII, taking up his residence in the Vatican. Despite Monsignor Merry del Val's youth his linguistic knowledge, which included a fine command of English, French, Spanish and Italian, and his cosmopolitan training qualified him admirably for the fulfilment of various important missions. In 1887 he accom-

panied the papal envoy, Monsignoi Scilla, to Queen Victoria's jubilee and in 1896 went as papal delegate to Canada to investigate the question of separate Catholic schools in Manitoba, his report to the Holy See calling forth the Affari vos, Leo XIII's famous letter to the Catholics of Canada. It was likewise in 18% that Monsignor Merry del Val was made secretary to the commission appointed to determine the validity of Anglican orders. In 1899 1901 he was president of the College for Noble Ecclesiastics, in 1900 was consecrated titular bishop of Nicæa and in 1902 made titular archbishop of Nicocia The same year he was appointed papal envoy to the cotonation of King Edward VII and his book on the Truths of the Papal Claims' was given to the public In the interregnum following the death of Leo XIII, Cardinal Oreglia, dean of the College of Cardinals, named Archbishop Merry del Val secretary to the conclave of cardinals that elected Pius X. This pointiff appointed the young archbishop Papal Secretary of State and on 9 Nov. 1903, clevated him to the cardinalate Cardinal Merry del Val was secretary of the Supreme Congregation of the Holy Office from 1914. In 1913 he succeeded Cardinal Rampolla as archpitest of the Basilica of St. Peter's. His term of office as Papal Secretary of State ex-pired at the death of His Holmess Pope Pius X. He died in Rome, 26 Feb 1930.

MERRY ENGLAND, a popular name for England. The word merry is used, not in the sense of garety, but according to its earlier meaning, that is, agreeable, or pleasant; as in the phrase, "merry month of May"

MERRY MOUNT, a district near the present town of Quincy, Mass., which in the early colonial days of New England was occupied by a party of men belonging to the Church of England. They paid little respect to the rigid and austere habits of the Puritans whom they greatly offended by the laxity of their manners. An attack was made upon this settlement by the forces of the Plymouth colony in 1630. John Lothrop Motley, the Instorian, produced in 1849 a romance cuttled 'Merry Mount'

MERRY WIVES OF WINDSOR, The, Shakespeare's greatest prose play It contains only about 15 per cent of verse lines, and in the spirit of its scenes is equally subdued, save for a flash of the old fire in the fairy poetry at the close. Dennis and Rowe report a story, current at the opening of the 18th century and inherently plausible, to the effect that this play was written within two weeks to the special order of Queen Elizabeth, who desired to see Falstaff in love. The wish is worthy of the Queen's taste and the manner in which it was satisfied indicates that Shakespeare did not work spontaneously. In point of time the play belongs with the greatest comedies—with 'Much Ado about Nothing,' 'Twelfth Night,' and 'As You Like it'. It was licensed for publication in January 1602 and most likely composed shortly before, for it is hard to believe that the Falstaff of this play can have been created while recollection of the great Falstaff of 'Henry IV' (1597, 1598) was very fresh in the author's mind. There is a radical difference between the two characters. In the 'Merry Wives' Falstaff loses most of his peculiar wit and all the graver, pathetic side of his char-

acter. He loses his charm, not only for the spectator but for his companions. There is a sense of positive disaster in seeing the invincibly lovable knight of 'Henry IV' and 'Henry V' betrayed by his own creatures, Nym and Pistol (II, 1), just as there is in hearing the Titame hat of the Gadshill episode ignomimously relating to Brook Ford (in III, v) the whole sorry truth of his discomfiture "I do begin to perceive that I am made an ass," he is forced to say in the final scene, and Shakespeare must have telt as keenly as his readers the pity of thus reducing Falstatt to the level of Dog-berry and Bottom. The play is brisk and en-tertaining, and is constructed with masterly technique, but it deals wholly with the externals technique, but it dears whon with the externals of character and with unlikely incidents. Its type figures. Slender, Sir Hugh, Dr Caius, the Host, when compared with Mercutio, Sir Toby, or the old Falstall, are like pygmics after grants. There is no teason to believe that The Merry Wives of Windsor's was regarded with the control of the old problems. After the control of the old problems of the old problems of the old problems. special tayor by the blizabethans. After the Restoration it seems to have become one of the most popular of Shakespeare's comedies. though Samuel Pepys registers emphatic dissent when noting in his diary that on 15 Aug 1667 he saw 'The Merry Wives of Windsor,' "which did not please me at all, in no part of it." Piecisely a century after its first publication, in 1702, a revised version by Dennis was brought out with the title, 'The Comical Gallant, or The Amours of Sir John Falstaffe' Since the use of the comantic movement, it has been one of the least liked of Shakespeare's comedies
Tucker Brooke.

MERSEN, Treaty of, effected 8 Aug. 870 at Mersen, Holland, between Charles the Bald of France and his half brother Louis of Germany by which Lotharingra or Lorrane, the kingdom of their nephew Lothair II (d. 869), was divided between the east and west Frankish realms—France and Germany—From this date the history of the two national divisions and of the European state system begins.

MERSEY, mer'zi, fingland, a river formed at Stockport by the union of the rivers Goyle and Tame. It flows in a general southwest divection to Runcoin, where it expands into an estuary two to three miles broad, near the mouth of which, on the north side, is Liverpool, with Birkenhead opposite, and below which it joins the Irish Sea. Since 1886 a railway tunnel under the Mersey has afforded communication between Liverpool and Birkenhead. The entire length of the river, including the estuary, is 70 miles. Principal affluent, the Livell, to which it is navigable. The Bollin and the Weaver are affluents from Cheshire. With the Mersey and Irwell is now closely connected the great Manchester shipcanal (q.v.) which opens into it.

MERSHON, Ralph Davenport, American electrical engineer and inventor: b. Zanesville, Olno, 14 July 1808. In 1890 he was graduated at Ohio State University; from 1891 to 1900 was connected with the Westinghouse Company at Pittsburgh and New York, and thereafter entered private practice as consulting engineer. He installed several important high voltage transmission systems in Colorado, Montreal, Tokio, Japan and in South Africa He invented the six-phase rotary converter, a com-

pounded rotary converter, a system of lightning protection for electric apparatus and a compensating voltmeter. In 1012-13 he was president of the American Institute of Electrical Engineers and is a member or Fellow of several scientific societies. He is the author of numerous technical papers.

MERSINA, Turkey, town on the southeast coast on the Gult of Alexandretta, south by west of Adana. It is one of the principal seaports of the south coast. The climate is unhealthful in summer The harbor is an open roadstead. An American mission is located here and there is also a consular agent of the United States Pop. 15,000, half of whom are Christians, Armeman, Greek and European.

MERSON, Luc Oliver, French painter: b. Paris, 21 May 1846, d 14 Nov. 1920. He studied at the ficole des Beaux Arts and under G. Chassevent and of Pils. His first picture exhibited in the Salon was 'Leucothea and Anaxandros' (1867) In 1869 he carried off the Grand Prix de Rome, the supreme ambition of art students, by his painting 'The Soldier of Marathon.' He produced the same year 'Apollo the Destroyer,' now in the Museum of Castres. In 1872 he painted 'The Martyrdom of Saint Edmind of England' (Museum of Troyes). Thereafter he devoted his pencil to the portrayal of legendary and mythological scenes and incidents. His chief works in this class are 'The Vision, a Legend of the 14th Century' (1873); 'A Patriot Sacrifice' (1874); 'Saint Michael' (1875), 'Saint Francis and the Wolf of Agubbio' (1878); 'Saint Isidoie' (a triptych) (1879); 'The Judgment of Paris witnessed by Eros' (1884); 'Mankind and Fortune' (1892); 'The Annunciation' (1903). He also frescoed with scenes from the life of Louis IX the walls of the Saint Louis gallery in the Palais de Justice at Paris.

MERTHYR TYDFIL, mer'ther tid'vil, or TYDVIL, Wales, a market and manufacturing borough of Glamorganshire, 24 miles by rail northwest of Cardiff, on the Taff, at the northern end of Taff Vale. It is the third largest place in Wales, and with the suburbs is 27 square miles in area. From an unimportant village in 1780, Merthyr Tydfil has become a prosperous centre of steel and iron manufactures, owing to its situation near the valuable coal and mineral fields of South Wales. Bessemer steel was first rolled into rails here Since the local iron became reduced, the pig is mainly imported from Belgium The town has undergone much modern improvement and is noted for its municipal enterprises, one of its investments being the purchase of the historic Cyfarthfa Castle, with a small lake and 62 acres of ground, and converting them into a public park Public baths and two sewage farms are maintained. Pop. about 80,000.

MERTON, Walter de, English bishop: d. about 27 Oct. 1277 He was graduated at Oxford University, of which he was appointed chancellor by Henry III in 1261, and three years later instituted the collegiate, or separate house system of the English University, by establishing the college which is called after his name. Here the secular clergy were to be educated in philosophy, the liberal arts and theology. The system he thus introduced has been the secret of success both to Oxford and Cambridge, and

was originated chiefly with the object of raising up secular schools which might check the power of the monasteries and eventually supersede them as centres of education. He was appointed bishop of Rochester in 1274.

MERTON COLLEGE, Oxford, England, was originally founded in 1264 at Malden, Surrey, by Walter de Meiton (q v), and removed to Oxford in 1274, where its collegiate buildings are among the oldest and most interesting in the city, the chapel especially being noted for its proportions and beauty. The foundation consists of a warden, 19 fellows, 18 postmasters or scholars, 34 exhibitioners, four lecturers, two chaplains, and of about 150 undergraduates. Among its famous alumni are Harvey, the demonstrator of the circulation of the blood, Anthony Wood, Sir Thomas Bodley and Sir Richard Steele.

MERU, mer'oo, Hindu mythology, the sacred mountain at the earth's centre on whose summit resides Siva, sustaining and uniting earth, heaven and hell. It contained the cities of the Hindu gods, and was the abode of the celestial beings. It was believed that the planets revolved around it.

MERV, Turcoman, S S R (Russia), an oasis in Central Asia, in the east of Northern Persia, and about 120 miles north of the frontier of Afghanistan, now traversed by the railroad from the Caspian to Samarkand It has an area of 1,900 square miles, and is crossed by the 37th meridian and 62d parallel. One-fourth of this area is artificially irrigated. It is watered by the Murghab and produces wheat, watered by the Murghab and produces wheat, cotton, sugar, silk, etc. In the midst of the casts are the ruins of the ancient town of Merv, founded by Alexander the Great, and subsequently held by Syrians, Arabs, Mongols and Persians A new town, New Merv, has grown up on the Murghab where the Trans-Caspian Railway crosses the river, with a citadely it has been made the castal and its a citadel; it has been made the capital and its population is about 15,000. The oasis generally is the principal seat of the Tekke Turcomans, who from this centre used to make predatory incursions into Persia and Afghanistan. In 1815 the oasis was subjugated by the Khan of Khiva, to whom it remained tributary for about 20 years. Subsequently Persia attempted to make good the claims which it had long made to this district, and in 1860 fitted out an expedition for the purpose, which, however, miscarried completely, as did another expedition in 1876 In 1881 General Skobeleff led a Russian expedition against the Tekke Turcomans, captured their stronghold of Geok-Tepe, and received the submission of their principal leader. The district of Merv subsequently came under the power of Russia Mery is of great strategical importance, and considerable interest was attached to it in connection with the advances made by Russia in the direction of India Pop. 250,000.

MERWIN, Henry Childs, American lawyer: b. Pittsfield, Mass., 5 Aug. 1853; d. 21 Jan. 1929 He was graduated from Harvard in 1874 and was for a time lecturer in the law school of Boston University He was employed by the Massachusetts legislature after 1900 to write and revise statutes Besides editing several legal works he was the author of 'Patentability of Inventions' (1884); 'Road, Track and Stable' (1893); 'Life of Anion Burr' (1899); 'Life of Thomas Jefferson' (1901); 'Life of Biet Harte' (1910); 'The Horse' (1916).

MERYCODUS, or COSORYX, a small antiered antelope fossil in the Miocene formations of the western United States. It was about the size of a dorcas gazelle, but with shorter limbs and neck and belonged to the family Antilocaprida, now represented only by the pronghorn; but it bore relatively tall three-tined antiers, which were deciduous and precisely like those of deer. Minute lateral toe-rudiments hung high above all the hoofs, but these were relatively smaller than in deer, in the modern pronghorn no trace of these temans. It was probably a collateral ancestor of the antelopes. Blastomeryx is a closely related genus somewhat more primitive. A very complete skeleton, collected by W. D. Matthew, is exhibited in the American Museum of Natural History at New York

MÉRYON, Charles, sharl mā-rē-ôn, French etcher: b. Paris, 23 Nov. 1821; d Charenton, 14 Feb. 1868. He entered the navy, after studying at Brest, but failing health, forced his resignation, and he settled in Paris, studying etching there. His chief works were picturesque spots in old Paris, many since destroyed. A series of 23 plates by him appeared 1850-54. His last years were spent in an insane asylum at Charlenton Consult Wedmore, 'Méryon and Méryon's Paris' (1879), Burty, (L'Œuvre de Charles Méryon,' translated by Huish (1879); Bouvenne, 'Notes et Souvenirs sur Charles Méryon' (1883).

MESA, Ariz., town in Maticopa County, alt 1,161 feet, on the Southern Pacific Railroad, 105m NW. of Tucson The city is surrounded by irrigated farm lands, and its industrial activities are connected with the packing of citrus fruits and vegetables, and the ginning of cotton. The town has a public library and a hospital. There is a Mormon temple. Roosevelt Dam is near by. Government is by a mayor and council The water-supply system is publicly owned. Pop. (1930) 3,711; (1940) 7,224.

MESA, or TABLE MOUNTAIN, any flat topped hill which stands out promunently above the surrounding area. The flatness is usually due to a horizontal layer of hard rock capping the hill. Many of our most noted mesa areas are the result of lava flows that cap and protect softer layers beneath. Butte is sometimes used in a similar sense, though it is more often applied to steep-sided prominent hills that are not notably flat-topped.

MESA VERDE NATIONAL PARK, Colo., a reservation of 48,966 acres in Montezuma County, southwestern Colorado Within its area, in canyons of the Mancos River, are the most remarkable of the many ruins of prehistoric cliff dwellings in the southwestern United States The Mesa Verde (Sp. "greentable" so named from its vegetation) is a high table-land, dividing the Mancos and Montezuma valleys. This mesa is clevated above the valleys some 2,000 feet, and rises abruptly from their floors, with precipitous sides, like the walls of a canyon. The northern extremity of this great mesa terminates in Point Lookout, which juts out between the two valleys, a landmark for miles in all directions. The highest

part of the Mesa Verde National Park, Park Point, near the northern boundary, is 8,574 teet above sea level, while Point Lookout has an elevation of 8,428 teet above sea-level. The northern edge of the mesa terminates in a precipitous bluff, averaging 2,000 feet above the floor of the Montezuma Valley. The general slope of the mesa is to the south, so that a person on the northern rim has a view in all directions. The surface of this table-land is broken by unumerable canyons, which start from the very edge of the mesa on the northern and western sides, and, growing deeper and more rugged as they descend, finally open out into the Mancos Canyon These canyons have many great caverns in their side walls, with the overhangmg tock for tools, and in these caverns are found the runs of the cliff dwellings. The principal turns are found in Navajo, Chiff, Soda. Long and Rock Canyons, though there are hundieds of lesser rums in all the canyons in the park. Spruce Tree House is in Spruce Canyon, a branch of Navajo; Cliff Palace is in Cliff Canyon; Balcony House is in Soda; Peabody House and Inaccessible are in Navajo; Long House is in Rock Canyon A rum in Long Canyon was entered by one of the rangers in 1914 for the first time since it was abandoned by its original tenants. Its difficult approach had protected it from all vandalism, and it was found just as it had been lett, no one knows how long ago. One sealed room contained a fine collection of jars and implements. It was reached by swinging a ladder over the cliff, anchoring it at the top, and letting it swing Down this swinging ladder the ranger went and then anchored it at the bottom. Now tourists make the descent. These ruined houses, or villages, are found in the recesses of the canyou walls and, protected from the weather, are remarkably well preserved. Some of them are small, with only a few rooms, while others are large and must have accommodated a large population. The mins found on the mesas, without the protection of the overhanging cliffs, have not withstood the ravages of time and are now but mounds of stone and earth.

While the ruins in the Mancos Canyon were explored as early as 1874, the most important escaped discovery until 1888, when R. Wetherill and C. Mason of Mancos, in search of a stray herd one day in December, penetrated a pinyon wood to the edge of a deep-side canyon. In the opposite cliff, sheltered by a huge, massive vault of rock, there lay before their astonished eyes a whole town, with towers and walls, rising out of a heap of ruins. They named the place "Cliff Palace," and the same day discovered nearby, in another canyon, another large cliff dwelling to which they gave the name of Spruce Tree House, from a great spruce growing among the ruins. The word dwelling is misleading, for most of these buildings were villages. Spruce Tree House, for instance, was undoubtedly a town of importance, harboring at least 350 inhabitants.

The arrangement of houses in a cliff dwelling of the size of Cliff Palace, for example, is characteristic and intimately associated with the distribution of the social divisions of the inhabitants. The population was composed of a number of units, possibly clans, each of which had its own social organization more or less

distinct from others, a condition that appears in the arrangement of rooms. The rooms occupied by a clan were not necessarily connected, although generally neighboring rooms were disinguished from one another by their uses Thus, each clan had its men's 100ms, which was ceremonally called the "kiva" Here the men of the clan practically lived, engaged in their occupations Fach clan had also one or more 100ms, which may be styled the living 100ms, and other enclosures, for granaries or storage of corn. The corn was ground into meal in another 100m containing the metate set in a bin or stone box, and in some instances in fireplaces, although these were generally placed in the plazas or on the housetops. All these dif-ferent rooms, taken together, constitute the houses that belonged to one clan

The conviction that each kiva denotes a distinct social unit, as a clan or a family, is supported by a general similarity in the masonry of the kiva walls and that of adjacent houses ascribed to the same clan. From the number of these rooms it would appear that there were at least 23 social units or clans in Cliff Palace. The kivas were the rooms where the men spent most of the time devoted to ceremones, councils and other gatherings. In the social conditions prevalent at Cliff Palace the religious fraternity was limited to the men of the clan.

Apparently there is no uniformity in the distribution of the kivas. As it was prescribed that these rooms should be subterranean, the greatest number were placed in front of the rectangular buildings, where it was easiest to excavate them. But when necessary these structures were built far back in the cave and enclosed by a double wall, the intervals between whose sections were filled with earth or rubble to raise it to the level of the kiva roof. In that way they were artificially made subterranean, as the ritual required. Easily reached from Denver and Colorado Springs, Mancos on the Rio Grande Southern Railroad is the preferable starting point by stage or automobile to explore the mesa. Consult United States Department of Interior Bulletins 'The Mesa Verde National Park' (Washington, I) C, 1915); Nordenskjold, B, 'The Cliff Dwellers of the Mesa Verde' (Stockholm 1893)

MESABI RANGE. See Iron Ore — Iron Ore Districts.

MESCAL, a fiery liquor produced in Mexico from several species of Agave (qv). The most famous liquor, however, is made from the "hearts" of the species Agave tequileana. The city of Tequila, in the state of Jalisco, is the centre of this particular industry. The Tequila Agave resembles in the appearance of its stiff lance-like leaves the sisal hemp plant, though it sends out its leaves from a great bulb-like cellular mass which forms the heart of the plant. This heart, when denuded from its leaves and detached from the root, is cleft in two, and a dozen of these pieces make a fair load for a mule, for they must be transported from the fields where grown to the city, sometimes a journey of several miles. These hearts are loasted in pits, within the distillery enclosures, dug four or five feet deep and considerably wider. A hot fire is built of mesquite wood, and large stones distributed through the fuel The "heads" are then heaped over the burning

mass until a huge mound is formed, which is covered first with grass and then with earth, and the mass left several days to cook. When the mound is opened the raw product is found to have changed to a dull brown in color, and the juices to have been converted into sugar. White hot and steaming, the mass is taken to another pit, stone-paved, on the bottom of which revolves a heavy stone crusher, really an arrester operated by mule power. Here it is ground into pulp and the semi-liquid mass carried in deep trays on the heads of Indians to the vats where it remains to ferment. Then it goes to the rude stills, and is run off as mescal. The commercial mescal is a colorless liquor sometimes with a slight amber tint, though much of it is like alcohol. Some of the higher grades are given fancy names which serve as trademarks. It is far too strong a liquor to be drunk with impunity, though its fiery quality seems to suit the Mexican taste for hot things. Zotol is another liquor, made in the same way from the bulb-like heart of a species of Dasylirion, which is said to be as strong as 95 per cent alcohol. These liquors should not be confounded with aguardiente, which is made from sugarcane. The Mexican name means burning water.

MESCALA. See MEXCALA.

MESCALEROS (Spanish, mescal, a native drink used in Mexico, Guatemala, and along the southern boundary of the United States), an Apache tribe so called because of their love of mescal. Somewhat of a nomadic character, they covered territory, at times, between the Rio Grande and the Pecos in New Mexico and southward into Mexico. They gave the governments of the United States and Mexico trouble, from time to time, but not so much as their relatives in Arizona and northern Mexico In 1873 a reservation of 475,000 acres was set apart for the use of the Mescaleros in Southern New Mexico. The tribe now numbers about 500.

MESDAG, Hendrik Willem, Dutch marine painter: b Groningen, 23 Feb 1831; d. 1915. He was a banker, following in his father's footsteps, until his 36th year, when he devoted himself to art, studied under Alma Tadema, who was a relative, and under Roelofs, and lived at The Hague, with a studio at Scheveningen. He took a foremost rank among modern painters of the sea, and conveyed the idea of water-masses and motions very felicitously. He presented his splendid collection of paintings and art objects to the nation. Mesdag's pictures include 'Fishing Boats at Scheveningen,' (Strand of Scheveningen,' (Morning on the Scheldt,' (In Peril,') and many other views of the North Sea. Consult Zilken, 'H. W. Mesdag' (English version by Bell, 1896); and Marius, 'Dutch Painting of the Nineteenth Century' (1908).

MESENTERY, a double fold of the peritoneum which attaches the small intestine to the spinal column, but in such a manner as to permit great freedom of motion. The corresponding support of the large intestine is the nesocolon, with the mesorectum. The mesentery contains between its folds several bloodvessels, lacteals, lymphatics, nerves, and the ganglia called mesenteric glands, which are connected with the lymphatico-lacteal system,

It is about four inches wide, and extends nearly the whole length of the intestine. It is subject to several diseases, the most frequent of which is tubercular degeneration of some of its numerous glands. For this and other diseases of the mesentery, see Permonnis.

MESHA, kmg of Moab mentioned in II Kings iii, 2–27. This monarch threw off the yoke of Israel, then ruled by Ahab and the latter's sons, Ahaziah and Jehoram. Later Jehoram, with the aid of the kings of Judah and Edom, defeated Mesha and his hosts. Mesha was defeated and besieged in Kir-hareseth, but managed to hold out against his enemies although his country was overrum. See Moabire Stone.

MESHED, mesh'ed, or MESHHED, mesh'hed, Persia, capital of the province of Khorasan, in an extensive valley 500 miles northeast of Ispahan. It is surrounded by walls, and has many ruined houses, but its principal street is spacious and handsome, having a water-course, the banks of which are shaded by trees, passing through it, while at its extremity are seen the splendid cupola and gilded minarets of the mosque containing the shrine of Iman Riza, the tomb has a gorgeous interior, a vast hall, like the central nave of a certific to the central nave of a cathedral, rising loftily into a central dome ornamented with the richest colors and a profusion of gilding This shrine attracts a vast number of pilgrims Here also is the mosque of Gohur Shah, considered one of the most beautiful and splended in Persia. The chief manufactures are velvets, sword-blades and some silk and cotton goods. A considerable number of the inhabitants are employed in cutting the turquoises obtained in the vicinity. The situation of Meshed on several great caravan routes makes it an important entrepôt for the produce of surrounding countries. The customs receipts for the territory approximated \$250,000 annually up to 1914, were much lower during the World War, but have increased since. Pop. about 85,000.

MESHTROVITCH, Ivan, Jugoslav sculptor: b Otavice, Northern Dalmatia, 1883, the son of a Croat. He was educated at the Vienna Academy of Arts and first exhibited his work in that city in 1902, and in 1911 his studies for the Serbian National Temple at Kossovo were shown in Rome. An artist of the highest type, endowed with astonishing ability, he is regarded in Europe — especially in England — as one of the greatest sculptors that ever lived In 1915 a representative committee brought him to Loudon and organized an exhibition of his works at the Victoria and Albert Museum. Art, political idealism, mythology and religious mysticism are inseparably bound up in his creations. His remarkable talent is expressed in the eclectic variety of styles of which he is master; it would seem that all known styles culminate in Mesh-trovitch: Egyptian, Greek, Baroque, Byzantine, Assyrian and the most violently realistic modernism. Consult 'Ivan Mestiovič: A Monograph' (London 1919), by Sir John Lavery, Dr. Seton-Watson and others, with 68 photographic plates.

MESMER, Friedrich (or Franz) Anton, frēd'ric an'tōn měs'měr, German physician: b. Itzmang, near Constance, Baden, 23 May

1733; d. Meersburg, Baden, 5 March 1815 He was educated in medicine by Van Swieten and De Haen of the University of Vienna, made some study of astrology, came to believe in the influence of the stars, and attributed this supposed influence to magnetism. Having at first believed in the cure of diseased bodies by the use of magnets, he came wholly to discard the magnets and declared that an occult force, which he called animal magnetism, pervading the universe, resided in himself and afforded him an influence over others. In 1778 he went to Paris and set the town astir. He had undoubtedly an honest belief in the efficiery of his discoveries: but he took advantage of popular interest to enshroud his methods with mystery. Finally the government appointed a committee of noted physicians and members of the Academy of Sciences, including Benjamin Franklin, to investigate the matter, and the committee in a report, admitting many facts but attributing them to physiological causes and not to any such supposed agency as animal magnetism, so discredited Mesmer that he went to London, and later to Germany. The name mesmerism was formerly applied to the entire class of phenomena now known as hypnotism (qv.). It is now claimed that there is a force in the human hody generally called magnetiscor, which is under the control of the human will, and that when the control of this force passes to another Among his writings are hypnotism occurs 'Mémoires sur la Découverte du Magnétisme Animal' (1779); 'Historie Abrégée du Mag-nétisme Animal' (1783); and the 'Mémoire de F. A. Mesmer sur ses Découvertes' (1799). See Hypnorism.

MESMERISM. See Hypnotism.

MESNE (men) PROCESS, in law, an intermediate process which issues pending the suit upon some collateral interlocutory matter. Sometimes it is put in contradistinction to primary and final process, or process of execution, and then it signifies all such processes as intervene between the beginning and end of a suit.

MESODERM. See Anatomy, Comparative; Embryology.

MESOHIPPUS. See Horse, Evolution of the

MESONERO ROMANOS, mā-sō-nā'rō rö-ma'nos, Ramon, Spanish writer: b. Madrid, 1803; d. 1882. After a short time spent in mercantile life he turned to journalism, and after some time spent on the Madrid Press he founded the Semanario Pintoresco Español which he continued to edit and manage until 1842. Mesonero was a great lover of his native city which, in his youth, was still the old-fashioned Spanish capital teening with true native life, before it had begun to reflect the fashions, customs and manners of Paus He tubbed elbows with his fellow city-dwellers everywhere and on every occasion, and out of this intimacy sprang interesting and wellwritten sketches of popular types, manners and customs. His comprehensive knowledge of his native city appears in 'Manual de Madrid'; (Escenas Matritenses) (2 vols, 1836); 'Memorias de un setentón' (1880), and 'El Antigno Madrid,' Mesonero is one of the masters of modern Spanish. His language is ever graceful, tending to a slight diffuseness; but always preserving its purity and idiomatic complexion and force A collected edition of his works was published in Madrid in 1881 under the title 'Obras completas de Ramón Mesonero Romanos' In 1903-05 two volumes more of his lutherto unpublished writings also appeared in Madrid Consult for biographical sketch, Northup, G. T., 'Selections from Mesonero Romanos' (New York 1913)

MESONYCHIDÆ, a family of Creodonts, prevailingly North American, which were more highly specialized than any other. They acquired a wolf-like form, with a very long slender tail, and legs and feet digitigrade gart indicating powers of speed beyond those of any other creodont. Their heads, however, were disproportionately large and bear-like. The general structure, nevertheless, shows that they could not have been rapid and aggressive in their habits, and their teeth suggest that they lived principally on vesectable diet. Their development into hyenalike creatures may be traced to nearly the close of the Eocene.

MESONYX, a primitive carmivorous animal of the group Creodonta (qv), which must have resembled in external aspects, when alive, the modern Tasmanian wolf of Australia. Its remains are found fossil in the fresh-water formations of Forene Age along the eastern base of the Rocky Mountains, and a complete skeleton is mounted in the museum of Princeton University, and a restoration is exhibited in the American Museum of Natural History in New York. This specimen (Mesonyr obtusidens) indicates an animal as large as a Saint Bernard dog, with its hindquarters drooped somewhat, like those of a hyena and a very long, slender tail. It is the type of a large family (Mesonychides) of wolf-like beasts widely distributed in Focene time. Consult Woodward, 'Vertebrate Paleontology' (London 1898); Osborn, 'Age of Mainmals' (New York 1910).

MESOPHYTE (Gr "mid-grower"), in botany and forestry, a term used of plants which grow naturally in soil of moderate mosture. Thus the term is contrasted on the one hand with xerophyte, "dry-grower," and hydrophyte, "wet-grower," these latter terms being applied to plants requiring very little or very much moisture. Since soil of moderate moisture varies from moist to dry, whereas both the dryer and wetter soils are comparatively invariable in this respect, it naturally follows that Mesophytic plants show more adaptability to conditions of moisture than either hydrophytes or xerophytes. For the same reason, no doubt, the mesophytic flora, being comparatively stronger, is denser and marked by much wider variations of species, than the scanty and monotonous growths of poorer, because of wetter or dryer, soils

MESOPOTAMIA or IRAQ, an independent state under a mandatory power, comprising the territory lying between the Euphrates and Tigris in Western Asia. The Arabs call those rivers El-Frat and Shatt respectively; the latter is also called Ed-Dijleh in its lower course. This region, extending from Arabia to Persia, was formerly included in the Ottoman empire. Its independence was recognized in the treaty of peace with Turkey, after the World War, and it was placed under mandate to Great Britain. A council of state was formed in 1920 and administered the country under the man-

date provisions. On 23 Aug. 1921 the British High Commissioner proclaimed the Emir Faisal King of the Iraq, 96 per cent of the populace having voted for him. The territory is divided naving voted for him. The territory is divided into the vilayets of Mosul, 35,130 square miles, Bagdad, 54,540 square miles, and Basra, 53,580 square miles, total, 143,250 square miles. The population of Mesopotamia, or Iraq, according to the census of 1932, was 2,857,077—Bagdad, 1,362,800; Basra, 789,800, and Mosul, 704,688. The country to which the name properly applies as extending between the two erly applies as extending between the two rivers has a gradual fall of nearly 1,000 feet from the spurs of the Taurus range to an old coastline south of Hit, whence an almost un-broken plain stretches to the Persian Gulf. The natives give the name of El Jezireh (the island) to the upper or northwestern portion, and that of Irak Arabi (the ancient Babylon) to the lower or southeastern section. This latter, indeed, is often excluded as being beyond the confines of Mesopotamia proper. Low ranges of hills break the great plain of Upper Mesopotamia, between them the Khabur and its tubutaries flow to the Euphrates, through a desolate region that was once thickly populated. The mountain district bordering the plain and stretching to the Persian frontier loims part of "Kurdistan," a mere name that has no concrete geographical existence, being mostly comprised in the vilayet of Diarbekr and belonging mainly to Mesopotamia Ethnically it includes the Kurdish and the Arab nomad tribes — respectively of Iranian and Semitic stock Upper Mesopotamia is rich in grain, wine and pasturage; the lower is flat, dry and unfrutful. Between the Khabur and the Euphrates lies the Biblical Aram-Naharam, or Syria of the Two Waters, also called Padan-Aram, or Syria of the Plain. It is mentioned in the Old Testament in connection with Isaac and Jacob (Gen 24 and 27) The Greek title was probably not in use till after Alexander the Great invaded the East. The soil consists of a sandy clay of excellent agricultural properties; only where water fails is it incapable of cultivation. Its remarkable fertility is shown by the fact that it still remains unexhausted after having supported through many centuries the Assyrian, Babylonian and Persian empires The number and vastness of the ruins that he scattered over this region from Babylon to Nineveh still bear silent testimony to its former flourishing condition. Since the cunciform inscriptions gathered from these ruins have yielded up their secret to the researches of modern science, we have learnt with certainty that the plains of Mesopotamia were the scenes of successive civilizations, rivaled in splendor and antiquity only by those of ancient Egypt To-day, in certain localities, may be found lions, leopards, wild asses, boars and gazelles

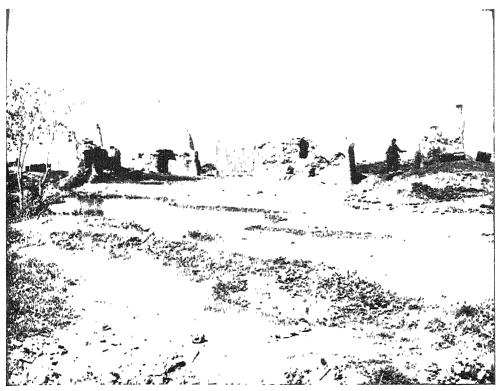
Mesopotamia is essentially a land of origins; so far as we know it cradled the human race and nurtured it for centuries until a new era was introduced by the Flood incidents, which are recorded not only in the Hebrew Scriptures, but also in the cuneiform inscriptions. Its early history is one of constant struggles for supremacy between contending nations Mesopotamia and its adjacent plains have been associated with some of the most important turning-points of human history; for milleniums

these lands contained the capitals of great world-empires and have been closely connected with the most thilling epochs of history. Even in the World War of 1914-18, Mesopotamia-by reason of the Bagdad Railway schemes—played a rôle the importance of which is as yet but inadequately recognized, for that railroad was the keystone in the German aspirations toward a world-empire. The man aspirations toward a world-empire. The Mesopotamians sprang from the Chaldarans, the primitive inhabitants; from the Cushites, who in the reign of Nimrod built the cities of Edessa and Nisibis, and from the descendants of Shem, of the tribe of Thaia. The Hebrew race took its rise from this land when Abraham came from Ur of the Chaldees and settled in Canaan. It was also in this plain of Shinai that the confusion of tongues occurred. Baby-Ionia was the mother of astronomy, and the 12 divisions on the dials of our clocks originated there, while the influence of Hammurahi's famous laws has penetrated down the ages into the legal codes of modern times through the intricate systems of Greek and Roman legislators Mesopotamia was originally a part of Nimrod's dominions, the founder of Calneh or Nippur After an interval of more than 700 years (2000 BC) Cushan Rishatham reigned in Mesopotamia, who extended his territory over the Euphrates. The Israelites, who then possessed Palestine, were compelled to pay him tribute for the space of eight years In the Golden Age of the Assyrian power (700) BC) Mesopotamia was entirely subjected to that empire, and suffered the fate of its subsequent conquerors. Trajan brought it under Roman dominion in 106 An, but the Persians did not permit the Romans to remain long in undisturbed possession, for it was a constant cause of war between the Roman and Persian empires, and at last Jovian surrendered it to the Persians in 363 AD. When the Arabs in 651 established a new empire upon the ruins of the Sassanide kingdom, Mesopotamia was also obliged to submit to the storm. In 1040 it fell into the hands of the Seljuks From that time it had many rulers in 1apid succession. Genghiz Khan made himself master of it in 1218, but in 1360 it fell into the hands of Tur Ali Bey Timur conquered it 40 years later, and in 1514 it was incorporated in the Persian Empire under Ismael Sophi In 1554, however, the Persians were compelled to surrender more than half of it to the Turks; and though they again recovered the lost portion in 1613, they were unable to withstand the attacks of Amurath IV, who united this in 1637, with many other provinces, to his empire. Despite its vicissitudes and the wars fought on its soil, the country remained rich and prosperous until the battle of Kadisia (635 A.D.) placed it at the mercy of the Arabs Assyria and Babylonia were the wealthiest countries of antiquity, and Mesopotamia was the richest part of the great Persian Empire. In olden times Babylonia was perfectly irrigated, but the wonderful system of canals fell into ruins under the Turks nomads pressed forward the peasants were driven from their lands, and the great irrigation works were neglected, and the Euphrates, no longer controlled, spread out into wide fever-bearing marshes The work of devastation commenced by the Arabs was completed by Tartars, Mongols and Turks, with the result

that one of the most fertile regions in the world became practically a desert abandoned to nomads. Arabs now form the majority of the population, though the original inhabitants are still represented by Kurds, Yezidis or "devil worshipers," Nestorians, Chaldwans or Roman-Catholic Arameans and Jacobites in the north: and by Salians in the south. There are about 80,000. Arabic speaking, lews resident in Mesopotamia who guard with reverence the traditional tombs of Joshua near Bagdad, of the prophet Ezekiel near the banks of the Emphrates, and of Ezra the Scribe on the Tigus near Kurnah Besides its wealth of biblical associations, Mesopotamia is a land of sacred memories to hundreds of millions of Mohammedans. Two gilded domes on the splendid mosque at Kazmain cover the tombs of enument teachers; this and the mosque at Samatra are Shigh shrines. A nule away, on the left bank of the Tigris, is the stately Hanifi mosque of the Sunns at Muaththam, and the famous mosque of Abd ul Kadir is in Bagdad. The tomb of Mohammed's barber, Salman Pak, is near the runned arch of Cresiphon The holy Mohammedan cities of Kerbela and Nejif are near the banks of the Euphrates, to which thousands of embalmed corpses are brought by pilgrims every year from India and Persia for interment. Under the blighting misrule of the Turk Mesopotamia became one of the most desolate countries on earth, swarming with vermin and insects. What little manufactime is carried on is used for home consumption. Sugar, cloth, coffee, iron, indigo and copper are imported; the chief exports are dates, wool, cereals, gum, rice and hides. The foreign trade is mainly with Great Britain, India and Persia, From ancient times the country has been noted for its oil springs. The wells at Kirkuk and Jibbeh and others have been producing oil for centuries. The modern fields are on the Persian Gull and in the Mosul region. Steamers can navigate the Euphrates as 1ar up as Meskinch. The principal towns are Diarbeki, Urfa (Edessa), Harran, Mosul and Bagdad. Basra, on the Shatt el-Arab (the confluence of the Tigris and Euphrates from Kurna) is the port of transhipment from river to ocean craft. The standard of education in Iraq is being steadily raised and public interest is increasing In 1922 the foundation stone of the future Bagdad University was laid and construction was begun.

Mesopotamia and the War.—It has already been mentioned that Mesopotamia was the keystone of the Pan-German scheme by reason of the Bagdad Railway. According to German authorities on the subject, there were three alternative plans to promote the expansion of Germany into a great world-empire. In the early stages of the Pan-German movement, the vision of its advocates was fixed upon South America as the most promising territory upon which a Greater Germany might be built. Here, however, the Monroe Doctrine stood in the way. The British Empire, as the largest landholder in the world, then became the focus of the Pan-Germanists, and here, again, a formidable barrier stood in the path—the British navy. Two avenues being thus barred by obstacles which could only be removed by an overwhelmingly powerful fleet, a third plan presented itself, a plan which provided for an

MESOPOTAMIA



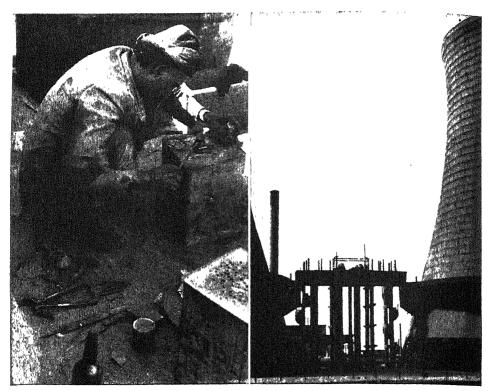
Primitive native Mesopotamian oil refineries have been used for centuries.



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Mounds of grain awaiting shipment from Basra in Iraq (Mesopotamia).

MESOPOTAMIA



Native oil dealer repairing containers for his product

Modern petroleum plant near Kirkuk, Iraq (Mesopotamia).



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Shipping barreled oil from Iraq (Mesopotamia).

overland expansion where no Montoe Doctrine existed and no British navy could intervene The scheme was to gain control of the Balkan peninsula by the elimination of Serbia, the only hostile barrier separating the Central Powers from a friendly power, Bulgaria This accomplished, the road lay open to Constantinople, a function which, in its turn, opened the door to Asia, via the Persian Gulf; to East Africa and The principal artery of communica-Australia tion lay in Mesopotamia - the Bagdad Railway It was calculated that this project could be carried out without coming into physical contact with either British territory or navy, and would place Germany in a position eventually to strike both at India and Egypt, a variation of Napoleon's plan of campaign for breaking the power of Britain According to Prince Bulow, former German chancellor, this undertaking "threw open to German influence and German enterprise a field of activity between the Mediterranean Sea and the Persian Gulf, on the rivers Emphrates and Tigris, and along their banks. If one can speak of boundless prospects anywhere, it is in Mesopotamia⁹ (Imperial Germany, p. 116). These words were no exaggeration, for Sir William Willcocks, an English engineer who had surveyed the country and planned a greantic system of irrigation, part of which he had carried out before the war, had said, in 1903, that "Of all the regions of the earth, no region is more favored by nature for the production of cereals than the lands on the Tigits." This authority stated that the irrigable area of Mesopotamia was from two to three times as large as that of Egypt, which leads to the presumption that the country could support some 30,000,000 people. Persia and Turkey being decrepit and morrhund states, the Pan-Germanists saw in Mesopotamia a field for exploitation which would make it for Germany what Egypt was to Great Britain or Morocco to France. German professors had painted the possibilities of this region to enthusiastic audiences in glowing colors, and had not omitted to point out that a German foothold on the Persian Gulf would imperit the position of Great Britain in India and Egypt. Now the most important route of the British Empire is the sea-route from England to India and Australia via the Suez Canal. The value of the Persian Gulf as a strategical British position has been pointed out by Admiral Mahan, on account of the Red Sea being merely a continuation of the Suez Canal, both of which could be dominated by a hostile power holding the gulf The British, however, have not awakened to the importance of the gulf only in recent years, for already in the days of Queen Elizabeth it was visited by English vessels; before ever the Turkish crescent appeared on the shore of Arabia the English flag was known and respected in the Persian Gulf. The East India Company planted a depôt at Bandar Abbas in its early days and for nearly two centuries fought with Dutch and Portuguese rivals. The Anglo-Indian navy first surveyed the gulf and provided for its lighting to guide navigation. For 50 years the British hunted the pirates in the gulf and destroyed their strongholds. Altogether, for 300 years the British have been the guardians of the gulf, by protecting Persia, suppressing gun-running and slavery, fighting the plague and introducing the elements of sanita-

tion among the natives on the coastline that Great Britain took in return was a spot on an island for a telegraph station; but she allowed no compromise on one point — that no power should be permitted to seize territory and no other flag should dominate those waters. The future of India and of the empire was bound up with British prestige in the Persian These considerations explain the suspicion and mistrust of Great Britain regarding the absorption of Mesopotamia by Germany an avowedly hostile power In 1899 a German company obtained a concession from the Sultan to build a railroad from Konich - the terminal of the Anatolian Railway - to Bagdad and Basra on the Persian Gulf, and from that year dates the German penetration of Mesopotamia. On realizing the political objects underlying the scheme, Great Britain protested and a diplomatic conflict began which was still in progress when the war broke out During 1913-14 a strange medley of diplomatic nego-tiations were being held on the question of Mesopotamia and the railway, in which England, France, Russia, Germany and Turkey were involved, with the result that Germany obtained the acquiescence of the powers to be the sole concessionnaire of the railroad, though England forced Germany and Turkey to fix the terminal well inland at Basra. The lighting, marking and policing of the gulf by England was confirmed by Turkey. Meanwhile, Russian diplomacy had succeeded in creating intangible "spheres of influence" in Turkish territory by which the German railroad through Mesopotamia was hemmed in on either side, while Great Britain held the key of the exit. As compensation for being restricted at that exit, Germany received a concession to build a line from the Bagdad Railway to Alexandretta on the Mediterranean. At a later date Great Bistain was apparently willing to grant an ex-tension of the German sphere, for Prince Lichnowsky (qv) records in his famous Memorandum that "the greatest concession Sir Edward Grey made to me personally was the continua-tion of the line to Basra. We had not insisted on this terminus in order to establish connection with Alexandretta Hitherto Bagdad had been the terminus of the line In April 1941 the Regent of Iraq, Punce Abdul Illah was deposed following a coup d'etat by Rashid Ali al-Gailani, a pro-Nazi The latter started an undeclared war against the British who landed forces at Basra on 19 April. Iraqi forces attacked the British airdrome at Habbaniyeh near Bag-dad but were repulsed with severe losses. Nazi aid arrived soon after via Syrian airfields and the conflict became largely one of air battles between the Nazis and the R.A.F. On 24 May 1941 it was reported that the regent Prince Abdul Illah had returned to Iraq and

Prince Abdul Illah had returned to Iraq and was setting up a new administration. For details of the fighting see War, European, 1939—Vol. 28, p. 782.

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MESOZOIC ERA, in geology, the midperiod of life in geologic time, also called the Secondary Period. Paleozoic precedes and Cenozoic follows this era, these two terms refer-ring respectively to "older" and "newer," or "Gearlier" and "later," forms of prehistoric lite. The subdivisions of the Mesozoic are the Tuas sic, Jurassic and Cretaceous periods (94 v.)

The Life of the Mesozoic - The life history of the cra can be best understood, by first referring to the life of the Paleozoic (q v) That era was closed under conditions (andity, glaciation and mountain making) unfavorable to plant and animal life, and as a result many unfit genera failed to live from Paleozote on into Mesozoic. The long-hinged brachiopods, so characteristic of the earlier era, became extinct early in the latter. A few of the more primitive types persisted, but brachiopods be-came relatively unimportant. The old straight cephalopods practically became extinct with the passing of the Paleozoic. The nautilus type lived on through, even to the present time, but the era was characterized particularly by the dominance of a type called the ammonites, which appeared in late Paleozoic and died out at the close of the Cretaceous. They evolved rapidly and are valuable time markers. The Mesozoic has often been called the age of rep-This group of vertebrates, which appeared toward the close of the Paleozoic, in primitive form, developed rapidly into a number of highly specialized types. The Dimosairs (terrible reptiles) developed along several lines The carmivorous group walked on two legs, the two front limbs being very short. It was this reptile that made the famous three-tood tracks of the Connecticut Valley. Some of these Dinosaurs got to be as long as 40 feet. Hetbivorous types also developed, great awkward beasts, some of them 80 feet long, 16 feet high and weighing probably 30 tons or more. This type were the largest land animals that ever lived Late in the era peculiar armored Dinosaurs also appeared, with great horns on their heads and spikes on their tails. The Ichthyosaurs (fish reptiles) took to the sea and developed fins, much after the manner of modern fish. The Pterosaur (wing reptiles) developed the power of flight, some of them having a wing spread of 20 feet. These unusual reptiles all died off suddenly at the close of the Cretaceous, and in the following era reptiles took on a modern aspect. Peculiar birds with teeth,

the first known representatives of the feathered world, are found fossil in Jurassic and Cretaceous rocks A lew primitive mammals, mostly of very small size, are known in the Mesozoic, but the group did not develop rapidly until after the close of this cra. Among plants, the common groups of flowering plants did not appear until Cretaceous times

Paleogeography of the Mesozoic in United During Triassic and Jurassic times practically all of the United States east of the Mississippi was land During Cretaceous the sea encroached on the coastal plain but did not teach the eastern interior region. The history of the west was more complex. During the Thassic a considerable part of the Pacific Coast region was under water but most of the interior was land. Similar conditions prevailed during early Imassic, but late in the period a great arm of the sea encroached from the Arctic, reaching as far south as northern Colorado. The great differences in lossils seem to indicate that this bay was not connected with the Pacific directly. This arm of the sea withdrew before the end of the period which was marked in California and Oregon by great folding and intrusions of igneous rocks, making the mountain ranges known as the Sierra Nevada and Cascades. In the west the Upper Cretaceous was marked by a great inland sea, over the site of the Great Plains and Rocky Mountains, reaching from the Gulf of Mexico to the Arctic Ocean. Toward the close of the period this sea retreated, leaving great swamps in which coal was formed. The Era was brought to a close by a great period of tolding known as the Lanamide Revolution which uplifted the Rocky Mountain Range.

MESQUITA, mas ke'(a, Salvador de, Brazilian poet b Rio de Lanetto, 1616; d. Rome, in the early 18th century. He went to Rome, where he entered holy orders and was well known for his Latin scholarship. His Sacrificium Jephtha? (1680), a sacred drama, established his poetic fame among contemporaries. His tranedies from profane history, Demetrius? Perseus and Prastas Bithym? all appearing at Rome between 1690 and 1700, also had once high rank

MESQUITE, a tree or shitth (Prosoput alandulosa and P juliflora) of the family Mimovacear Several species of mesquite are very common in the southwestern United States from Texas to California, extending southward through Mexico and tropical America. In the United States they are usually shrubs, but faither south large trees. The branches are armed with spine, the leaves compound, of numerous leaflets, the flowers small and greenish, in spikes, and the fruit of long indehiscent pods. In the arid southwest the mesquite is often the only source of firewood, which is not obtained from the branches, but from the very large roots. The pods are eaten by cattle, and sometimes by people, for their sweet pulp and seeds. The screw-pod mesquite or tornillo is Prosopis pubescens, another southwestern plant, whose pods are coiled in a tight spiral, resembling a screw.

MESS, in the army and navy, and particularly the latter, a company of officers, or crew of a ship, who cat, drink and associate together; in military language, a sort of military

ordinary, established and regulated by the rules of the service, for all the officers in a regiment, and supported by their joint subscriptions, supplemented by a small government allowance Similar institutions are extended to the non commissioned officers of a regiment, The enlisted men mess by companies as a rule, but often it is desirable to cut the company into squads for mess purposes. The post commander usually appoints some officer to take charge of mess arrangements. In active service the officers are apt to mess with their own troops, but in camps they have their separate mess. In the many it is usually convenient to have a captain's mess, another for the ward-room officers, another for the juntor officers, another for the warrant officers, etc. The men's mess for the sailors or marines is styled the "general mess," but this is usually divided into sections, as a matter of convenience. It has become common to employ ammunition passers as mess attendants.

MESSAGER, André Charles, French composet: b. Montluçon, 30 Dec 1853. He received his musical education at Ecole Niedermeyer, Paris, and subsequently studied under Saint-Saens in the same city. He was appointed organist at Saint Sulpice in 1874. A symphony of his won the gold medal of the Société des Compositeurs in 1876. In 1880 Messager became music director at Sainte Marie-des-Batignolles. Three years later he completed the comic opera by Bernicat, François des bas bleus, and in 1885 produced his own operettas, La l'auvette du temple, and La Béarnaise. The following year saw the production of his ballet, 'Les deux pigeons' at the Opéra. Messager's reputation, however, was most enhanced by the comic opera 'La Basoche,' produced at the Opéra Comique in 1990 and in English in Condon in 1891. It was followed by the operas 'Madame Chrysantheme' (1893); 'Mirette' (1894); 'Les petites Michus' (1897) and 'Véronique' (1898); 'Les dragons de l'impératrice' (1905); 'Fortunio' (1907); 'Béatrice) (1914). Messager became conductor at the Opera Comique in 1898; was one of the di-rectors of the Covent Garden Opera in 1901— 07, and first conductor at the Paris Grand Opéra after 1907. From 1907 to 1914 he was also joint director with Broussan of the Grand Opéra and after 1908 was conductor of the Concerts du Conservatoire. Died, 24 Feb. 1929

MESSALA (me-sa'la) CORVINUS, Marcus Valerius, Roman soldier, orator and writer: b. about 65 bc; d. about 2 bc. He received a part of his education in Athens, returned to Rome before the second triumvirate and joined the Senatorial party. He fought with Brutus and Cassius at Philippi, 42 bc, and afterward attached himself successively to Antony and Octavius, served at the battle of Actium, 31 bc., and the same year was chosen consul. He subdued Aquitania, of which he was made proconsul and was honored with a triumph. For a time he was a prefect of Rome and held the office of augur. Messala was the friend of Horace and other distinguished men of the age, a realous patron of literature and art, notably of the poet Tibullus, and one of the most eminent of Roman orators.

MESSALINA, mes-a-li'na, Valeria, Roman empress. She married Claudius (later em-

peror) in 38 AD; bore him a daughter, Octavia, and a son, Britannicus; proved herself vicious, licentious and vulgar by her many open amours; and in her husband's absence formally married Gaius Silius, whom she attempted to make emperor Claudius refused or delayed to punish her, and Narcissus, the emperor's favoite, had her put to death (whether with Claudius' knowledge or not is not known) in 48 AD. Her reputation was whitewashed in Stahr's 'Agiippina, die Mutter Neros' (1880).

MESSENE, më-së'në, the capital of Messenia in Peloponnesus, founded by Epaminondas (369 BC) after his victory of Leuctra over the Lacedæmonians, and situated at the foot of the hill of Ithome, the fortress of which formed the acropolis of the new capital. The latter was surrounded by massive stone walls, flanked with towers, of which there are still considerable remains at the modern village of Mavronati. The Greek Archæological Society, in 1895, excavated a colonnade and other parts of the ancient agoia. Messene with its acropolis was, next to Corinth, the strongest city of Peloponnesus. It was supplied with water from a fountain called Clepsydra, the spring of which still exists.

MESSENIA, me'sē'nī-a, Greece, a department in the westein part of Morea (Peloponnesus), bounded on the south and west by the Ionian Sea The population of this administrative division, including the refugees from Asia Minor, is 248,000 The greater part of the surface is a fertile plain, but there are mountainous lands in the east and northeast. Kalamata, the capital, is in the southeast on the Gulf of Koron (Messenian Gulf). When Messenia was a state of ancient Greece its chief cities were Methone and Pylos (Navarino) Later Messcue (Mavromati) was the capital, and the strong mountain fortress was Ithome A ridge of Mount Taygetus separated Messenia from Messenia is celebrated for the long struggle of the inhabitants with the Lace-dæmonians in defense of their liberty. In the first Messenian War (743-723 BC) the Lace-dæmonians, with the Athenians, invaded Messenia. For 20 years the Messenians defended themselves valiantly under their king Aristodemus, who in consequence of an answer of the Delphic oracle which promised them the victory on condition of the sacrifice of a virgin of the royal family, offered his own daughter as the victim. Her lover, to save her life, de-clared her to be pregnant by himself; and Aristodemus, to prove her innocence, stabbed her with his own hand, and caused her to be opened and sacrificed The Messenians, though for some time successful, were finally obliged to submit by the loss of Ithome. About 40 years after they again rose, and thus commenced the second Messenian War (685 BC), which ended in their entire subjugation A part of the Messenians emigrated to Sicily, and there founded Messana (see Messina) on the site of the ancient Zancle (668 BC). Those who remained were reduced to the state of helots. After 200 years of servitude they again took up arms. This third Messenian War lasted 10 years (465-455 BC), and resulted in the expulsion of the Messenians from the Peloponnesus Epaminondas restored them, gathering together the exiles from the various lands in which they were scattered. Within the space of 85 days they completed and fortified Messene (300 n.c.) and maintained their independence till the country was conquered by the Romans (146 n.c.). The Messenians remained true to their customs, manners and language through all changes of fortune.

MESSHED. See Meshed

MESSIAH, The, is a term which is, in John i, 41, and, in John iv, 25, but without the article, applied to Jesus of Nazareth, as the appointed king of the Kingdom of God. The Greek word which is the translation of the Aramaic term meaning Messiah, namely, χριστός, in English Christ, is used of Jesu in this same sense throughout the New Testament. The word Messiah itself is a modified transcription of the Greek word. Messiah, as the word appears in the Authorized Version in both the passages cited above, and the form Messiah is due to the influence of the form of the original Aramaic and Hebrew word. For the word which appears in Greek as Messiah was, in Aramaic and Hebrew, The Christiah, as well as the Greek equivalent, χριστός, and the English Christ, mean Anomited One, and refer to Jesus, when applied to Jum, as God's Anointed King.

In the Old Testament, Dig P (Mašich) (English Messiah) is used, in a few cases, without the aiticle, and as an adjective, of priests, who were anointed to their office (Lev iv, 5 and 16, vi, 22). But, in the definite sense of the Anointed One, or the Messiah of Jehovah (the Lord's Anomted), it is used, with a very few possible exceptions, only of kings. Thus, in 1 Sam. ii, 35, it is used of the kings of Israel in general. In 1 Sam. xii, 3 and 5, xxiv, 6 and 10, it is used of Saul; and, in 2 Sam xiv, 21, xxiii, 1, it is applied to David. In Lam iv, 20, it denotes Zedekiah, King of Judah; and, in Isa, xlv, 1, it is applied to Cyrus, King of Persia Two possible exceptions to its use to denote kings may be found in Psa. cv, 15 (quoted in 1 Chron. xvi, 22) and Hab. ni, 13, where it seems to be used to mean the nation of Israel as the priest people of Jehovah, although, even in these cases, it may refer only to the king. In Daniel ix, 25 and 26, it is very difficult to decide the true meaning of this word, because of the great uncertainty in relation to the correct interpretation of these verses. According to the various interpretations which have been given to them this word would mean a high priest, a royal ruler, or that great king of the kingdom of God known to us as Jesus of Nazareth It is not certain, however, that both times it is used in these verses it has the same meaning. In Psalm ii, 2, the best and most probable interpretation would make the term denote the great coming king known to us as Jesus the Christ. This is the only pas-sage in the Old Testament in which this term can be taken with any reasonable degree of

probability to refer to our Saviour.

In the post-canonical literature, the first clear application of the term Messiah to the great coming king of Israel is found in the Psalter of Solomon, dating from about 63 BC.

In this poetical collection we have a full and clear description of this king and his work

under this title. There are, indeed, in the Sabylline Oracles and the Book of Enoch, expressions and terms which must be supposed to refer to the commo and expected king of Israel, but the name Messiah is not used in these writings.

While the pre Christian use of the term Messiali to denote the divinely appointed and eternal king of the kingdom of God is thus limited, the Old Testament abounds in statements and teachines relating to this king, and that form of the Kungdom of God in which he is to be ruler and sovereign a some of the passages relating to this final form of the Kingdom of God it is said that Jehovah himself will be the king, as he was, in reality, in all the history of the kindom of Israel Consult as examples of passages of this kind, Isa ii, 2.4, Isa xxxii, 2.2, Fzek xx, 3.3, Ezek xxxii, 15, Zeph iii, 15, Zech xiv, Io In other passages of the state of the sta sages, in harmony with the idea that, while lehovah was always the real king of Israel, he was represented in the government by a vicegerent king, his anorated on the throne of David at Jerusalem, it is declared that a great and eternal coming king, who, in some of the passages, is stated to be of the line of David, shall reign as king in the final form of the Kingdom of God Among the passages of this kind may be cited Psa ex, Isa ix, 6 and 7, Jer. xxiii, 5 8, Jer xxx, 8 and 9, Ezek xxxiv, 23 and 21, Ezek xxxvii, 21 Hosea iii, 4, Micah v, 2 5, Zech ix, 9 Just what will be the relation, m person and in nature, between Jehovah and this Davidic king, is not made clear, or even asserted, in the Old Testament.

Independently, therefore, of the use of the term Messah, there was a natural and sufficient basis in the Old Testament for the widely-spread belief in regard to the coming of a future Davidic king called the Messah, which appears to have existed in the time of Jesus. In this belief Jesus himself shared, and this king Messiah, or Christ, he both virtually and formally claimed that he himself was. A virtual claim of this kind is found in Matt xvi, 13-20, and in the parallel passages, Mark vii, 27-30, and Luke ix, 18-21, and also in the act done by Jesus, of which we have the record in Matt. xxi, 1-11, and the parallel passages, Mark xi, 1-10, and Luke xix, 29-40. A formal claim of Jesus to be the Messah is found in John iy, 25 and 26.

The rejection of the claims of Jesus by the Jewish nation, and the continuation in that nation of the belief in a coming Messiah, were the occasion of the appearance in Jewish history of several who claimed to be the Messiah after the time of Jesus. Of all these the one who was most generally received as the Messiah by the nation, and who accomplished the most for his people, was Simon bar Cochba (or bar Kozeba), who flourished 130 35 A.D., in the reign of the Emperor Hadrian. For two years and a half, bar Cochba reigned as king, and, at the head of an army of 200,000 men, defied the might of Rome. But, in the end, he and his nation were both crushed beneath the power of Rome.

The Jews of the present day are not all of the same opinion in regard to the Messianic hope. The conservative, or Orthodox, Jews are still looking for the coming of the Messiah, the great king of the line of David. With the liberal, or Reformed, Jews, so far as the term Messiah is used at all, it is made to stand for a personification of a system of ideas and doctrines, and the coming of the Messiah will be the universal acceptance and the worldwide domination of Jewish ideas and the Jewish

religion

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MESSIAH, The ('Der Messias'). Klopstock's 'Messiah' is German Pictism's most important contribution to literature and modern Germany's most pretentions epic poem, consisting of 19,458 dactylic hexameters as compared with the 12,310 of Homer's 'Odyssey' When the first three cantos appeared in 1748 in the 'Bremer Beiträge ('Bremen Contributions') it took the public a year to get accustomed to the novelty of its form and content, after which its success was unprecedented, its readers awaiting with impatience the next two cantos, which appeared in 1750, and the next five, which appeared in 1750, and the following cantos, appearing five in 1768 and five in 1773, were puolably as disappointing then as tiresome now.

The theme is the redemption of mankind, and the poem starts with Christ's entry into Jerusalem on Palm Sunday, the most exalted subject at hand for the young Jena student of theology, who at the academy of Pforta had come under the influence of Milton through the writings of Bodmer. On going to Leipzig in 1747 Klopstock recast the prose beginnings into hexameters, thus breaking with the tradi-

tional Alexandrines and toosing a storm of criticism on his head from the school of Gottsched, while that of Bodmer applauded. It has been said that the work of no German poet before Richard Wagner aroused such contro-Goethe's Autobiography tells us that his father banished the book from the house because of its blank verse. However, Klopstock broke the sway of the French in epic verse as Lessing did later in the drama, demonstrating the nearer affinity of German to English He learned a great deal from Milton, but his nature was essentially lyrical, contemplative, mystic, and he often smothers the epic possibilities of his subject in a flood of fervent, more or less scraphic, religious cestasy, which exhausts the reader. Instead of strong contrasts, going from darkness to light, from misery to bliss, he attempts to portray a mental state of continuous, dazzling bulliancy. Instead of an alternation of clashes there is a contemplative passivity, from which result endless repetitions and long drawn out speeches; so to speak, a massive elaboration of the text of Handel's oratorio, which was but seven years older. Certain descriptions, however, are very successful, such as those of hell, the council of the devils, their punishment through transformation, the trips through the universe made by angels and devils, and especially the vision of the last judgment. Klopstock's taking over of the Miltonic cosmography gave him the opportunity of portraying a great struggle between the powers of light and darkness for the soul of Christ and therefore of man, but instead his angels paralyze their adversaries with a look, which method of warfare is not though perhaps pictistic.

His forte is to excite feeling and to lend expression to the inexpressible even when his characters become speechless. No German poet before him had so mastered the capacities of the language, whether in choice of words or in rhythmic cadence. In a sense he became the creator of modern poetic diction. A flood of epic imitations on various biblical subjects attested his contemporary influence, and all the younger poets of his day learned from him, but the 19th century admired him from an ever increasing distance Edition: 'Werke,' Franz Muncker (Vols I and II, Stuttgart 1893); 'Messias und Oden' (Halle 1910). Critical: Wilhelm Scherer, 'Geschichte der deutschen Literatur' (12th ed., 1910); Franz Muncker, (Klopstocks Leben' (Chap' 4, Stuttgart 1893); G. E. Lessing 'Briefe,' XV, 'Brief: Ucber das Heldengedicht: Der Messias' (1753).

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MESSINA, mess-se'nä, Sicily, town and seaport, capital of the province and on the strait of the same name Messina is walled, flanked by bastions and defended by a citadel on the south and several forts both on the east and west. The harbor is one of the best in the Mediterranean and so much resembles a sickle that the town took its original Greek name from that implement, called sancle Fronting the harbor is a broad quay called the Marina, adorned with statues and fountains and forming a favorite promenade The streets of the old town are narrow and dirty, but the modern town, built

since the earthquake of 1783, is generally composed of houses of two stories and has spacious streets, well paved with blocks of lava. Among the public edifices are included nearly 50 churches, many of them of great beauty and adorned with fine sculptures and paintings. The cathedial is a Gothic structure, with a somewhat heavy exterior, but supported within by vast pillars of granite, supposed to have be-longed to a temple of Neptune. The viceroy's palace, the archiepiscopal palace, the senate house, grand seminary, college, large and wellendowed hospital, numerous convents, two theatres, lazaretto and arsenals are some of the The manuother buildings worthy of notice factures consist chiefly of silk goods. The trade, both transit and general, is extensive The principal exports are silks, olive oil, linseed and other seeds, oranges, lemons and other fruits; corn, wine and spirits; salted fish, licorice, lemon-juice, shumac, essences, rags, brimstone, etc. The tunny and other fisheries are carried on to a considerable extent. A destructive earthquake visited the locality 28 Dec. 1908 destroying about half of the buildings and causing the loss of more than 77,000 lives, probably more than half of them residents of Messina. The principal shock was at 521 AM, and the tidal wave that followed, 10 feet in height, swept all before it on the low shore. Notwithstanding this frightful casualty, the city so far recovered that in 1910 the exports were \$11,000,000 and the imports about \$5,000,-000. Messina has a government university, founded in 1549, which had 761 students in 1929 It has departments of law, medicine, science and classics. It has also a naval seminary and a number of elementary schools Messina, under the name of Zancle, is said to have been founded 1004 B.C.; the Messenians obtained possession 668 B.C.; it became a free city of Rome 241 B.C.; the Saracens captured it in 831; Richard I of England with his crusaders spent six months there in 101 seeking the form on six months there in 1191, sacking the town on leaving; from 1282 to 1713 the Spaniards ruled, though the French held it bruefly 1676-78, in 1743 a plague killed 40,000 of the inhabitants, in 1783 an earthquake caused large loss of life; in 1854, 15,000 deed of the cholera; in 1860 the city came under Italian rule, and was peaceful and prosperous until the 1908 tragedy. The population before the earthquake was 150,-000. In 1936 it was 192,051.

MESSINA, Strait of (Italian, Faro di Messina; Latin, Fretum Suulum), a channel which separates Sicily from Italy and connects the Tyrrhenian and the Ioman Sea. It has a length of about 20 miles, and gradually widening toward the south, attains, on the parallel of 38 a width of 11 miles; but in the north, where it is narrowest, does not exceed two miles. depth is great, in some parts over 4,000 feet, and a strong current continually running with the tide makes the navigation somewhat difficult, but by no means so formidable as was fabled by the ancients, to whom the rock of Scylla, and the whirlpool of Charybdis, on the opposite side, but at some distance to the south. seemed so dangerous that it was generally believed to be almost impossible to avoid the one without being dashed upon the other.

MESSMATFS. Animal. See COMMENSALISM.

MESSMER. Sebastian Gebhard, Catholic archlushop of Milwaukee b Goldach, Canton Saint Gall, Switzerland, 29 Aug 1847 Having passed the eight grades of the common school of his home village, he spent three years at the high school in the neighboring town of Roischach on the Lake of Constance In 1861 he went to the ecclesiastical preparatory college of Saint George's near the city of Saint Gall, where he finished his classical studies. In 1806 he proceeded to the University of Innsbruck in Tirol to study philosophy and theology and there was ordained to the priesthood, 23 July 1871. In October of the same year he came to Scion Hall College, the diocesan semmary of Newark, N J, where he taught various theological branches until 1889, when he was called to the chair of canon law at the newly-tounded Catholic University at Washington Before going there he spent the winter of 1889 at Rome, where he attended the lectures of the late Cardinal Guistini on the Justman or Roman Law, and in June 1890 took the degree of doctor of canon law in the Collegio Appollmate In November 1891 Dr. Messner was by the Holy See appointed hishop of Green Bay, Wis He was consecrated hishop on 27 March 1892, by his life-long friend, Bishop Zardetti, of Saint Cloud, Minn. later Archbishop of Bucharest in Rumania After the death of Archbishop Katzer of Milwankee in 1903 Bishop Messiner was appointed Archbishop of Milwaukee where he was installed on 10 Feb. 1901 His publications include Praxis Synodalis' (1883); Canonical Procedure' (1886); Sprrago's Method' (1901); Outlines of Public Knowledge' (1910); He edited Devivier's (Christian Apologetics) (1903); Bishop England's works (7 vols., 1908). With Bishop McFaul of Trenton, N. J., Dr. Messmer, then Bishop of Green Bay, became one of the founders of the Catholic Federation of America in 1901. From 1916 he was honorary president of the Catholic Hospital Association of the United States. Died 4 Aug. 1930.

MESTIZOS, mes tezos, or METIS (Spanish, mixed), half breeds; those of mixed blood, especially those descended from Indian and Spanish or Indian and Portuguese. In Mexico the European Spaniards are called Chapetones or Gachupines. See Criole

MESZÁROS, Lazar, Hungarian revolutionary soldier and patriot b Baja, County of Bács, 20 Feb. 1790, d Eywood, Herefordshire, England, lo Nov 1858. He was first educated for the Church, but subsequently studied law at Pesth. In 1813 he was summoned to join the Hungarian army by the Emperor Francis I; later entered the Austrian army, taking part in the campaigus of 1814. Is against Napoleon, and subsequently in Italy, and several years later was appointed colonel. He was in Italy in 1848, serving as a colonel in an Hussar regiment, when he was chosen by Count Batthyán, who had formed a new Cabinet, for the portfolio of Minister of War. Acting in this capacity he was largely instrumental in bringing the Hungarian army to a high degree of efficiency. In September of that year, having gone to the scene of war in the south, he was defeated before the Rascian ramparts of Szent Tamas. When Austria purposed the subjugation of Hungary, Mészáros took command of

the Hungarian forces in the north, but on 4 January his army was routed at Kaschu In April 1849 after the declaration of independence he again took command of the Hungarian forces, but after the defeats at Szoreg and Temesvár in August he fled to Turkey He subsequently lived in England, Prance, the island of Jersey, and in 1853 came to the United States

META, mā'ta, a tiver of South America, which has its rise on the eastern slope of the Andes Mountains near Bogotá in Colombia. It is formed by the junction of two small mountain streams, which unite about 40 miles southeast of Bogotá; then flows east-northeast into the Ormoco, a course of about 650 miles.

METABETCHOUAN, met"a-bet-choo-an', Canada, a river of Quebec flowing into Lake Saint John from the south It is a broad stream, 90 miles long, and navigable for a considerable distance. The celebrated Falls of Metabetchouan over 230 feet high are near its mouth

METABOLISM (Greek μεταβολή a change), the whole series of physico-chemical pro-cesses connected with the manufacture of protoplasm and with nutration and growth. Under the term is included all those changes by which various energy transformations are made possible in the human body. It has been divided into constituctive metabolism (anabolism), and destructive metabolism (katabolism) The former comprises the processes by which the substances taken as food are converted into protoplasm, while katabolism is the means by which the protoplasm is broken down into simpler products, such as the excretory or waste matters. Metabolism thus comprises the elementary vital phenomena of plant and animal life. These are the occurrences associated with changes of substance, of form and of energy All organisms undergo continual changes of their substance or protoplasm, etc, alterations of their form and transformations of the energy which they get from the environment. The human body is essentially an energy trans-Thus as regards food, since all living matter is continually undergoing decomposition, it must take in substances that contain all the chemical elements of which it is constructed, but the food differs with every form of cell Plants live cluelly on inorganic substances and animals on organic, that is, material already prepared; no animal being able to live on simple inorganic compounds. Among animals there is a remarkable adaptation to a single kind of food. For example the larva of the fur-moth lives exclusively upon the hairs of fur, which consist of pure keratin; this substance, which is closely allied to proteid, is therefore capable of furnishing all the elements necessary for the formation of the protoplasm of this caterpillar. Dogs when worked hard have been found to be able to live on pure proteid food. On the other hand, according to Verworn, it is impossible for an animal to live solely on carbo-On the hydrates or fats, or even on the two together, since there is no nitrogen in these substances.

Vital motion or metabolism is a complex sharply characterizing living organisms, and the taking in of food and the excretion of waste products give to the organism the material with which to regenerate itself and to grow. Metabohsm is increased by heat, the consumption of oxygen being increased in cold-blooded animals, but warm-blooded animals undergo a decrease under heat. Thus man in winter has a much more active metabolism than in summer, since he consumes more food at low temperatures.

It is claimed by Verworn that every species of animal possesses a specific metabolism, and that under certain conditions products of metabolism may stimulate an animal to increased growth, while under other circumstances they may retard growth. Thus the usually deadly unc acid in moderate amounts exerts a favorable influence on the size of larvæ of seaunchins Illustrations are afforded by experiments in raising snails and water-fleas (Daphnia) in small volumes of water; besides the diminished volume, the water fouled by their excretions may not only dwarf but gradually kill them, or produce changes of form Metabolism is more active in the young than in the adult Between 9 and 14 a boy requires as much food as a full-grown man, and during the next five years more than a man The same is not true of girls who increase the amount of metabolism up to the 11th year Consult Verworn, 'General Physiology'

Consult Verworn, 'General Physiology' (New York 1899); Bayliss, 'Principles of General Physiology' (New York 1915), Du Bois, E. F., 'Basal Metabolism in Health and Discase' (3d ed. 1936); Macleod, J. J. R., 'Carbohydrate Metabolism and Insulin' (1926).

METACENTRE, in hydrostatics, the point of intersection of a vertical line passing through the centre of gravity of a floating body as a ship in equilibrio, and a vertical line through the centre of gravity of the fluid displaced, if the body be turned through a small angle, so that the axis takes a position inclined to the vertical. If the metacentre is above the centre of gravity, the position of the body is stable; if below it, it is unstable. In shipbuilding a vessel must be so designed that its metacentre (its changing centre of buoyancy) is not likely to oscillate so as to permit capsizing.

METACHROSIS, the change of color brought about in the surface of certain animals, either voluntarily or involuntarily, to make them conform to their surroundings. It is exhibited in many of the lower animals as a protective device, especially in cuttlefishes, caterpillars, various amphibians, especially frogs and certain lizards, notably the chameleons. The certain lizards, notably the chameleons dark pigment to which the brown or gray colors of metachroic caterpillars are due is deposited in the cells of the outer skin, while the green coloring matter is found in the underlying fat; and, as Carpenter says, experiments have shown that the presence or absence of both kinds of pigment is determined by the surrounding objects through the quality of the light reflected from them, the suppression of the superficial dark pigment allowing the deeper green to show through the skin, and thus give its hue to the caterpillar It has been shown that the formation of the dark pigment is hindered by the action of certain yellow rays which are absorbed by dark objects, but reflected from green because the state of the flected from green leaves and shoots. The process of change in squids, frogs, etc, through nervous and muscular control of pigment sacs, called chromatophores, is somewhat different, and is explained in the article CHAMELEON.

The power possessed by these animals of adapting their color to their surroundings must be of great value in ensuring preservation from enenues. Consult Beddard, 'Animal Coloration' (1892).

METACINNABARITE, a native sulphid of mercury, occurring amorphously, when it is black or dark gray, or in tetrahedral crystals. To its black color it owes its early popular name, Æthiops mineral. Metacinnabarite is found in California

METAGENESIS, or HETEROGONY, a term proposed by Owen for a form of parthenogenesis. It is that form of alternation of generations (qv) of which one generation reproduces only asexually, by division or budding, the other exclusively by laying eggs. A good example is the mode of reproduction of hydromeduse in which the hydra-like stage gives rise to meduse, the latter laying eggs. Another case is that of the aphides, whose asexual individuals produce multitudes of young by budding, the next generation consisting of males and females, the latter laying fertilized eggs. An individual of the first generation is called the nuise; one of the second generation the sexual animal.

Another term for this phase of reproduction is heterogony (or heterogenesis), which Hertwig defines as "regressive alternation of generations". He mentions another form of heterogony where two generations with different forms and structure alternate. For example, a hermaphroditic thread-worm (Ascans nigrovenosa) lives in the lungs of frogs; it produces a form (Rhabdonema nigrovenosum) which lives in mud, and which lays eggs giving rise

to the ascaris of the frog.

METAHEWETTITE, a dark red mineral consisting of hydrous calcium vanadinite occurring in microscopic crystals with uraninite and carnotite at several localities in Utah. Probable composition CaO.3V₂O₆.91I₂O; a source of vanadium.

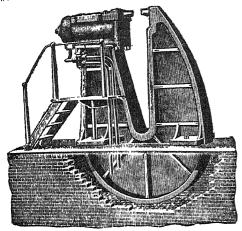
METAL WORK, any work done in metals, but especially handwork practised as a decorative art, in which the materials are metal and the designs are executed in repoussé or relief This may be accomplished either by carving or expert hammering as of thin sheet metal. The term includes jewelry (qv) and goldsmith's work; hence its materials are often the precious metals and its end personal adornment. But it is often applied to larger work and especially to metal decoration in architecture, apparently a later development in the arts than was the jeweler's trade, which flourished in classical antiquity, and everywhere seems to have quickly followed the most primary knowledge quickly followed the most period of metallurgy in industrial evolution. The Middle Ages were the great period of metal work, notably in connection with Gothic art. Even the more valuable metals were lavishly used in this epoch, as before in the Byzantine period, and since in the architecture of the Greek Church, above all in Russia. One of the foremost instances of Italian metal work is to be found in the altars of Saint James at Pistoria and of the haptistery of Saint John in Florence. Each of these was the work of a line of great artists, whose elaborate work upon them covered more than a century. Cellini

(qv) was the greatest metal worker of the 10th century Even more important than this work in silver and rold are the great bronze doors in the Florence haptistery, one by Ghiberti and another by Pisano, each the product of a score of years of labor, and both dating Wrought non work from the 15th century began to be used in the 12th century, between the 13th and the 18th centuries in the shape of gates, grilles and screens in ecclesiastical art, and in German locks and lunges of great beauty, it came to its most perfect form sepulchral brasses of Corman, French and English churches should also be mentioned. See BRASSIS

METAL WORKING MACHINERY, a term including practically all machines by which metals are converted into shapes required by modern structural work and the industrial trades. They may be conveniently arranged under the following natured classes: Lathes; horers or driffs; punches; shears, milling machines; grinders, riveters, drop hammers; hending rolls; rolling machines; presses; planers; saws and special machines

Lathes are turning machines used to obtain cylindrical stirfaces by rotating a bar of metal against a fixed cutting tool. They are metal against a fixed cutting tool. They are also used for spinning sheet metal into form. The principal parts are the head stock holding the driving cone and revolving spindle, the tail stock supporting the back centre, and capable of being clamped at any point on the centre line of the hed or frame, and the rest or carriage bearing the tool head. The bar of metal to be worked is fastened to the head and tail stocks and rotated or turned by belts from shafting or by electric motors, while the rest carrying the cutting tool is moved parallel with the axis of the bar from the surface of which a spiral shaving is removed. By suitable attachments the lathe may be used for tooling flat surfaces, sawing or grooving and cutting gear wheels. These machines are made in a great number of sizes, of which the principal forms may be designated as follows. (1) The hand lathe; driven by hand power, usually by a drill-bow, but sometimes by an assistant at the crank. It is without self acting feeding devices for regulating the cutting tool. (2) The foot lathe; small and light, worked by the operator's foot and adaptable to work as delicate as that of the watchmaker and jeweler. (3) The self-acting lathe; in which the cutting tool is held in a carriage which is moved by mechanical means, causing it to traverse automatically the object being turned these lathes are adapted for screw cutting and are often so designated (4) The chucking or face lathe; for turning cylinders several feet in diameter and many feet in length, such as engine cylinders and the tubing and jackets of large ordnance. The turret lathe belongs to chucking class, but the face of the chuck is horizontal, the revolving spindle being vertical. (5) The boring lathe, used for working on internal cylindrical surfaces. A bench lathe is a small model of any of the several types so arranged that it may be holted to a work bench. An automatic lathe is one of the larger types fitted with mechanism by which it stops itself when the work it is set to do has been completed. Any lathe may belong to the single geared or back geared

type. In the latter a set of gear wheels operates a back shaft, by which the speed of the work may be greatly reduced. Overhead shafting on the lathe standards or on the ceiling provides means for giving a revolving motion to the tools at work, thus affording a combined motion of great variety and intricacy for involved work



150 Ton Fixed Riveter

Borers or Drills.— Boring machines, if operated by hand power, are called "hand-drills," otherwise, "power drills". They are of two types, the horizontal and the vertical cutting tool is formed upon an axially rotating spindle designed to bore or drill cylindrical They vary greatly in size and pattern; in the number of spindles employed and the manner of their arrangement. Large holes, either horizontal, vertical or inclined, such as engine cylinders, tubing for ordinance and hollow shafting, are worked on a boring lathe, carrying usually two or more separate spindles clamped in a cylindrical tool head. Drills are especially useful as reamers to finish holes made by punches, and also to give exact cylindrical forms to the internal surfaces of hollow castings of any kind

Punches. -- Punching machines are of the single or multiple type, capable of punching one or several holes at a time. They are used for punching rivet holes in boiler and armor plates, plates for girders and other structural metal work. The perforation is accomplished by the thrust of a cylindrical punch under great pressure Though usually made to punch round holes they are also worked with "drifters" which square up the round holes. The power employed is steam or hydraulic, generated by individual engines for large and belt-driven machinery for small work.

Shears.—Shearing machines and punches are similar in general construction and operation, excepting that in the former cutting edges which pass each other like the blades of a pair of scissors take the place of the punching tool Their name and action sufficiently describe the purposes for which they are used.

Milling Machines.—Milling is a mechanical operation whereby work is machined by means of a rotary cutter to regular or irregular shapes. The existing types of milling machines are very numerous and their designs merge into

one another to a great extent. In general, the work is held on a table which moves under the cutters on the machine spindle. The table (and work) may be fed longitudinally, transversely, or vertically, or by any combination of these movements. Usually the milling machine has one spindle, although multiple spindle units are common. The table feeds in either direction, at a selected rate, with various cycles of operation The cutters used are of many different types and sizes, but the outline of the work and form of cutting edges are exactly similar, causing all work to be turned out uniform in size and shape Those cutters, the contours of which are formed, reproduce the outline of the work very accurately

Attachments allow the machines to perform many varieties of milling which would be difficult or impossible by other means Among the many available attachments are those to adapt a horizontal spindle machine to vertical work and vice-versa. Slotting, Rack Milling, Cam Cutting and Rotary Attachments, and all kinds of Index Centres are in common use Milling is used in all industries for producing mechanical parts having flat or curved surfaces, slots or keyways, for sawing, recessing and making gears of many types

Modern milling machines have been brought to a high degree of perfection. The automatic machines reproduce with great accuracy the form of any pattern inserted as a control practically without tension Two of the latest types of milling machines are shown in the illustra-

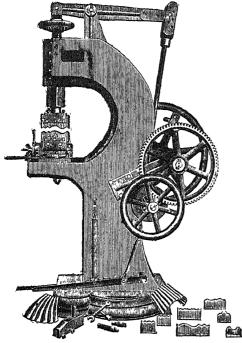
tions accompanying this article.

Grinders.— The recent development of grinding machines has placed them in the front rank of metal working machinery as the fin-ishers. They take work rough finished from the lathe and the milling machines and bring it to the finest degree of perfection Not only do they finish the work of the other machines, but they also grind to exquisite form the tools with which the other machines do their work In the automatic section the work is ground accurately to size regardless of the wear of the wheels during the process, beginning the grinding with a coarse feed and throwing in the fine feed automatically as the piece approaches its true size. The machine once set, piece after piece is automatically machined to pattern size without attention except the removal of the finished work and the placing of another rough piece. A great deal of work formerly turned to extreme accuracy on lathes is now finished direct from the forging on the supersensitive automatic grinder and with a very considerable saving of time. See GRINDING

Riveters .- Riveting machines are made in two forms, stationary and portable; the former used in heavy work are operated by pressure generated by steam or hydraulic power, while in the portable form the moving die is actuated by steam or compressed air, with hammer-like blows They are employed to drive and head hot rivets in boiler work, bridge building and other structural work with results far superior to hand work in rapidity and efficiency usual form of the stationary type is a U-shaped frame or yoke. The ends of the arms are provided with dies projecting inwardly, one being fixed while the other has a reciprocating mo-The rivet being placed in the hole is tıon compressed endwise between the dies; the pressure forces the metal of the rivet into the irregular edge of the hole, clamps the plates to-

gether and forms the nivet head

Drop Hammers.—Heavy drop hammers are used for torging and also for welding, and are operated by hydraulic or steam power. They consist of an anvil upon a solid base of steel blocks laid over oak timbers to give elasticity to the machine. Above the anvil vertical housings capped by steel arches support the hammering ram and the platforms upon which the piston cylinder and other actuating machinery is placed. By the use of swages, fullers and flatters, hot metal is hammered into forms, otten by the use of a progressive series of dies. The largest hammer of this kind was erected in 1891 at Bethlehem (Pa.) Steel Works. Its general dimensions and weight are as follows: Height, 90 feet; width, 42 feet; weight of anvil and foundation, 1,800 tons, weight of housings, steam thests, pressure cylinders and piston, about 1,000 tons. Ram 19 feet long, 10 feet wide and 4 feet thick,



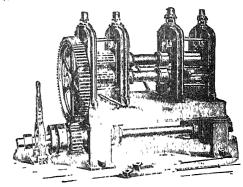
Light Drop-Hammer.

weighing 100 tons. Lighter forms of drop hammers are actuated by compressed air and are called pneumatic hammers. They are used principally as connice bending machines.

Bending Rolls and Benders are used generally in boiler and tank work; the metal plates being drawn by rotation between three rolls so arranged that their axes form the edges of a triangular prism, their relative adjustment determining the curve to which the plate is bent.

Rolling Machines are used to flatten out metal bars into plates and commercial shapes, such as I-beams, railroad rails, etc. As designed at present they accomplish in a short space of time a great variety of work which in times past was turned out by the more laborious and expensive processes of lathe turning and forging. One class is used to manufac-

ture boiler and armor plate and the general run of heavy sheet metal; while another class produces the thin sheet metal down to the finest grades such as tinfoil.



Tin-foil Rolling Mill.

Presses.- By the use of presses sheet or plate metal is converted into utensils of any desired form. They are usually operated by hydraulic power; are provided with dies between which the metal is pressed into the required form, and are capable of being constructed to exert an unlimited amount of pressure. Forging presses are made in all sizes adapted for uses ranging from the pressing of watch-cases to the forging of steamship shafts and of armor plates weighing up to 14,000 pounds. Forgings thus made are superior to hammered forgings. They are designed for working metals either hot or cold.

working metals either hot or cold.

Planers. Planing machines are used to obtain that surfaces on metal. There are two types; those in which the motion of the table relative to the cutting tool is rectilinear and those in which that motion is rotary. In general construction a planer consists of a traversing table on which the work is fastened; a bed to receive the table and guide it in a right line; a cross slide to support the slide rest carrying the tool, standards bolted to the bed and supporting the cross slide, and the mechanical devices for feeding and regulating purposes. The power supplied from shalting by belts is trans-formed by gear wheel attachments into the reciprocating motion of the table, causing it to slide back and forth between the vertical guides, thus bringing the work against the cut-ting tool which shaves off successively, side by side, narrow thin strips of metal until a perfeetly flat surface is produced. Planers are built in various sizes, the larger machines being equipped with tables 7 to 8 feet in width and 20 feet long.

Saws.—In metal working, saws belong to the class commonly termed finishing machinery. For cutting plates and bars into shorter lengths they are in extensive use, affording a great economy of time. They are built in a great many sizes and forms, both stationary and portable, equipped with single cutters or cutters arranged in gangs. For cutting off large bars such as steel beams, rails and similar shapes, saws with single cutters are generally used, the object being fastened to a carriage and moved into contact with the edge of the circular cutter. Some machines used for lighter work are so arranged that the circular saws are moved

into contact with the bars. The cutters are of two kinds. The friction disks made of soft mild steel, without teeth, measuring about 41 inches in diameter and three sixteenths of an inch in thickness, are used for cutting off either hot or cold metal. They are run at a high rate of speed, about 15,000 feet per minute, run velocity. The toothed cutters vary greatly in diameter and thickness, are made of highly-tempered steel, and are used for clean cutting in cold metal. They are usually run at a low rate of speed, the run velocity varying from 130 to 150 feet per minute. Friction disks run at run velocities between 20,000 and 25,000 feet per minute are called fusion disks, from the fact that the intense heat generated by the friction actually mets the metallic dust ground off by the cutter.

Special Machines.—This term includes an almost endless variety of metal-working machin-

special Machines. This term inclines an almost endless variety of metal-working machinery, capable of enumeration only in a very general way. They are used for special purposes such as making pins, nails, rivets, and pens, the tapping of nuts and the threading of bolts. Although often of very complex construction they turn out work with great rapidity and precision. In its special field metal-working machinery has not only displaced hand labor in all countries, and especially in the United States, but by its use structural work such as the building of magnificent buildings and bridges, powerful engines and mammoth ships have been produced far beyond the capabilities of that which is known indus-

trially as hand labor.

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METALLIC CURRENCY. See Currency.

METALLOID, met''l-oid, in chemistry, any nonnetallic element. These are 13, namely, sulplur, phosphorous, fluorme, chlorine, iodine, bromine, silicon, boron, carbon, nitrogen, hydrogen, oxygen, and selenium. The distinction between the metalloids and the metals is slight. The former, excepting selenium and phosphorus, do not have a metallic luster; they are poor conductors of heat and electricity, are generally not reflectors of light and not electropositive, that is, no metalloid fails of all these tests. The term seems to have been introduced into modern usage instead of nonmetals for the very reason that there is no hard and fast line between metals and nonmetals, so that metal-like or resembling metals is a better description of the class than the purely negative nonmetals. Originally it was applied to the nonmetals which are solid at ordinary temperatures.

METALLURGY, formerly defined as "the art of extracting metals from their ores"; now broadened to include "and the fitting of them to

industrial uses." It therefore comprises the various types of smelting and metal extraction; the production and refining of metals and alloys; casting, rolling, and forging, heat treatment and such matters as welding, brazing, and soldering Many of these branches of metallurgy are themselves large industries

When a company covers all the activities from mining the ore and smelting to fabricating and finishing final products, it is known as an "integrated" company A good example is Anaconda Copper Mining Company which with its chief subsidiary, American Brass Company, embraces all phases of the industry from mining to finishing and selling the semifinished and final products made from copper and its alloys. Steel foundries and iron foundries are examples of "nonintegrated" companies, because they start with such raw materials as pig iron and scrap, and usually do not mine ore and smelt their own

pig iron

The two broad divisions are often described as process metallurgy and physical metallurgy, the first covering smelling and the operation of foundries, rolling mills, and producing plants; the second covering the treatment, handling, and fabrication of metals after they have been produced. A process metallurgist must be familiar with chemistry, particularly at high temperatures, because he is usually dealing with molten metal and slags and their reaction on each other. He must also be a fuel technologist and understand

the principles of furnace design A physical metallurgist is mainly concerned with the internal constitution of the metals and alloys he is dealing with, and such subjects as heat treatment, plastic flow of metals, and the effect of stresses on metals. His work is based principally on physics as well as chemistry, and he must be familiar with modern research tools, such as the microscope, the use of X-rays, and the spectroscope. This branch of the industry attracts many women as well as men. Indeed, both major divisions (which interlock in many cases) make use of all the teachings of science, and almost every metallurgical company either has its own research laboratories, or employs people with scientific training to keep informed on new developments and adapt them to its own

Physical metallurgists are also employed by many industries that are not thought of as strictly metallurgical, such as automobile and tractor companies, or the electrical companies like General Electric or Westinghouse. This is because such companies use various metals and alloys in large quantities and have to test them and investigate their properties so as to employ them to the best advantage, also to carry out research work to discover new alloys with properties needed for new products One of the most interesting developments in recent years has been the production of metals to resist high temperatures and still remain strong, which metals are making possible the development of gas turbines and jet propulsion. Much of this work has been done by the research departments of the large electrical companies with assistance from the makers of tool steels and of metals and alloys already used for high temperature and corrosionresistant applications.

The history of metallurgy is very long and of great interest. It is true that metallurgy goes back far beyond recorded history. Man became

a tool-and-metal-using being very early in his development, and his continued progress depended very largely on his ability to produce and fabricate metals. The first major use of metals was for offensive and detensive weapons, such as swords, spears, and shields, and this still continues. Everyone realizes how dependent modern armies are on the metals and allows that go into tanks and gims, projectiles and bombs, modern an planes, as well as such equipment as radar, proximity fuzes, and signalling devices.

Our civilization, as we know it, depends on modern faining; on transportation by land, sea, and an; on rapid methods of communication, on books and newspapers, on good toads and highways; on machine tools and tools in general, whether they are saws and hundrings equipped with modern plumbing, radiators, elevators, and washing machines, along with numerous other pieces of equipment. All of these, together with almost every feature of our civilization, depend on metals in one form or another, such as copper and steel wire, cast non radiators, tungsten thaments in meandescent bulbs, or steel temforcing rods in concrete roads and buildings, or steel plate in bridges, ships, and freight cars. The list of metals and alloys and their uses is almost inhunited.

The metallurgist has reason to feel proud of his contributions to these various fields. Many examples could be given for instance, newspapers, books and printed or typewritten material of every kind depends very largely on type-metal, a direct contribution of applied metallurgy, and of the work of men in many countries. One of the great inventors of the world was Sir Henry Bessemer (qv), who as a boy spent many hours in his father's type-metal foundry and there learned the art of founding and the mixing and alloying of metals. This experience stood him in good stead later in life when he was trying to develop improved metal for cannon, which lead to the discovery of the Bessemer process of steelmaking. The great development of this country after the Civil War was largely due to improved transportation helped by the manufacture of rads and other radioad material by the Bessemer process, which was able to turn out the monimous toinage of steel that was needed at relatively low cost.

continuous toinnage of steel that was needed at relatively low cost.

Our enormous petroleum industry depends very largely on the cheap transportation alforded by pipe lines carrying crude oil and refinery products such as gasoline and kerosine. During the war one became impressed with the importance of this method of transportation when the Big Inch (24-inch diameter), and the I fittle Big Inch (20-inch diameter), lines were constructed to carry crude oil from Texas to the Atlantic Coast, a distance of about 1,100 miles. Pipeline transportation carries about one ninth of the freight toinnage moved in the country. It has been made possible by the development of scamless and welded pipe, and also by the development of welding lengths of pipe together by means of the oxyacetylene torch and the use of proper welding rods.

The gradual discovery of new metals, or of metals and alloys with new properties, was responsible for most of the development of mankind. Economists measure the importance of countries and races of people by their use of metals; and in the daily and weekly discussions of business, among the most important factors are the production and use of metals or the condition of the industries that produce them or depend on them.

The first important use of metals is often referred to as the Bionze Age when stone implements and weapons were replaced by those of metal. Bronze, an alloy of copper and tin, was not the only metal of this period; gold and some of its alloys were used for jewelry and onnaments; native copper was used in addition to

bronze; and steel was undoubtedly used, but rusted away, while bronze resisted the elements. The Bronze Age was succeeded by the Iron Age, then the "steel age," and it is often stated that we are now hiving in the "alloy steel age," because of the great development of special or alloy steels in recent years. Everyone remembers the great growth of the since about 1900 or 1905, but very few know how this was due in large part to the development and application of alloy steels. The Model "T" Ford when first introduced was not a success because the springs would not stand up and many broke. This serious problem was solved by the use of chrome variadium steel for springs, properly heat treated. Mr. Kent-Smith, an English metallingist, came to Detroit and helped work out this problem, because of the experience he had gained in Fingland with this new steel. Then as the automotive industry grew, there also developed the wide application of many alloy steels, and of heat treatment, one development helping the other to their great mutual advantage.

Machine shop practice has been revolutionized by the use of alloy tool steels and of special materials known as sintered carbides. It is said, even now, that modern machine tools do not develop all the advantages that high-speed tool steels and sintered carbides ofter when compared with the old carbon tool steels of 40 to 50 years ago.

Properties of Metals. Metals have characteristic properties distinguishing them from other materials. We usually think of them as relatively heavy, and with the exception of magnesium and aluminum, their density is fairly high, ranging from a specific gravity of 1.74 for magnesium to 22.4 for indition and 22.5 for osmium Of the well known metals, tin is 7.3, iron, 787; copper, 8.91; lead, 11.34; and gold, 19.3. Mercuty, or quicksilver, which is the only metal liquid at ordinary temperatures, is 13.55. Uranium is a heavy metal with a density of 18.7.

Most metals have a characteristic luster, generally regarded as their most striking quality, and usually accompanied by a particular color. For instance, everyone associates copper or silver, gold or platinum, with their respective colors, and the colors of many metals and alloys determine their use in industry or art.

All metals are crystalline, that is, their atoms are arranged in a regular order, and this propcity is of great importance in the study and application of metals and alloys. The atom arrangement is spoken of as the crystal lattice, and by means of examination with X-rays the size of the crystal cube or hexagon or thomb can be determined, as well as the distribution of the atoms within the cube or other shape. Many metals exist in allotropic forms and the crystal lattice is different in these various forms. Sometimes the external crystal forms are very beautiful and easily visible, as in the case of antimony when slowly cooled from fusion, or such alloys as ferrochrome; but even if the crystal form is not apparent to the eye, it is made evident when specimens are properly prepared and examined with the microscope or by means of X-rays One result of this crystal formation is that metals and alloys often have directional properties, that is, the physical values vary in different directions, and advantage is taken of this property many times in using them.

The internal structure of metals is closely

allied with the physical properties and is greatly influenced by the treatment the metal has undergone If cooled slowly from the molten condition. the structure is usually coarse and the material is brittle with little toughness. It, however, the metal is cooled quickly as in the case of die castings poined into a metal mold, then the structure is usually fine and the material has considerable toughness. The coarse cast structure of steel ingots and many other cast materials is broken up by forging and rolling, with corresponding improvements in physical properties, but the greatest and most striking change in the structure of metals is brought about by heat treatment, the variations in physical properties brought about by the latter method are amazing. This is one of the great fields of work of the physical metallurgist
The hardness of metals varies greatly Some,

The hardness of metals varies greatly Some, like lead, can be indented with the thumbnail Others, like properly made tungsten carbide, approach the diamond in hardness and are of great value as dies for the drawing of wire, or as tools for machine-shop use in cutting other metals and materials. Here again, proper heat treatment causes great changes in hardness. Properly annealed tool steel can be readily machined and shaped, but after hardening and tempering it is one of the hardest of materials. Many metals vary greatly in hardness according to the work imposed on them. Annealed brass is comparatively soft, but if cold-worked between rolls, or drawn through dies, the hardness is greatly increased. Brass sheet is sold and used in various hardnesses or tempers.

One very important property of metals is plasticity. Some, like gold and lead, can be readily shaped because they are plastic, and even steel has a plastic range. Because of this property, sheet metal can be shaped by deforming between dies, as in the case of automobile bodies and fenders, or brass cartridge cases. Also many sheet metals are "spun" into various symmetrical shapes such as reflectors. This property is influenced by temperature, and most metals are heated to make them more plastic before they are rolled or forged.

Many other properties of metals might be mentioned, such as corrosion resistance. The great growth in the use of stainless steel is familiar to everyone and is largely due to its resistance to the corrosion of the atmosphere and of many liquids (such as milk), of foods and of chemical solutions. The petroleum refining industry makes use of many metals and alloys because of their corrosion resistance, and this is true of various other industries, such as the production of synthetic fibers like rayon and nylon

Fuels.—Both the process and the physical metallurgist depend on high temperatures in many of their operations for the attainment of which fuels are needed. Every type of fuel is used in some operation or other, and improvements in the use of fuels, or availability of new fuels, register advances in both practice and economy. A good metallurgist must be thoroughly familiar with the fuels available and adapted to the particular operation he has in mind

The usual classification of fuels is solid, liquid, and gaseous. Typical examples of solids are coal and coke; of liquids are fuel oil and tar; and natural gas, city gas, producer gas, coke oven gas or blast furnace gas are typical gaseous fuels. However, many others are used for par-

ticular purposes, such as hydrogen or acetylene for welding, cutting, and brazing operations, and wood or charcoal in certain cases Electricity is used as a source of heat to an increasing extent. There are many kinds of electric furnaces, depending on the heat of the electric arc. The aluminum industry is based on its own type of arc furnace. The steel industry makes use of arc furnaces in the production of stainless steel, most types of tool steel, and a very large tonage of alloy steels. A great many heat treating furnaces are of the resistance type, the electric cuirent passing through resistors made of many different materials. Such furnaces can be automatically controlled with great precision. Since about 1935 high frequency heating has come into rapidly increasing use, where again electricity is the source of heat

The subject of fuels is of increasing importance because the cost of metallurgical operations depends very largely on the kind and amount of fuel used All fuels possess certain advantages over others Metallurgical coke is strong and porous. It supports the weight of the charge in a blast furnace or a foundry cupola, and when subject to the blast of cold or hot air near the bottom of the furnace burns very readily, giving the heat necessary for the operation Nothing has been found so far to replace it economically.

Gaseous fuel can be stored and transported very easily. It also burns readily and leaves no ash. Both gas and the air for combustion can be closely controlled, and burners can be automatically regulated, which means that furnace temperatures can be controlled. The furnace atmosphere can be made oxidizing or reducing as needed, or even neutral in character. Long furnaces can be designed which have burners at the proper intervals.

Most important of all, when using gaseous fuels, the principle of regeneration of heat can be applied. The hot waste furnace gases can pass through chambers filled with a checkerwork of fire brick, and the bricks heated, before the gases pass to the chimney stack. Then by means of suitable valves, the gaseous fuel and air for combustion can pass through such chambers before entering the furnace, and to the heat of combustion is added the physical heat from the bricks. This was the principle discovered by Friedrich Siemens in England in 1856 which made possible the construction of improved glass-melting furnaces and the open hearth furnace for steel making, and this principle is used in coke ovens and many types of heating furnaces.

The subject of fuels and their proper and economical use is so important that most metallurgical plants, especially steel plants, have a fuel engineer with a well staffed department.

Refractories.—Mention should be made of refractory materials which can resist heat and the corrosive action of molten slags and hot gases. They vary from natural sandstones and fireclays to artificial refractories of many kinds. Every advance or improvement in refractories leads to improvement in furnace design and construction, with consequent development of better metals and alloys, or to reduction in costs.

The usual classification is acid, basic and neutral. Typical examples of acid materials are fireclay and firebrick, silica brick and silica sand. The only basic refractories used in industry are calcined magnesite and either raw or calcined dolomite, although Henri Moissan, the French

scientist, did much of his research work with the use of blocks of burnt lime. Chromite, graphite, tarbon blocks, and water-cooled metal shapes are among the neutral refractories. Another refractory greatly used in foundry work is molding sand, which stands the temperature of molten metals and forms the molds into which such metal is poured. All of these refractories are important. They form the hearths, walls, and roofs of furnaces, mixtures of fireday and graphite are used for crucibles, ladles are fined with firebrick or with fireday, and without refractories metallingical operations could not be carried on. Research in the field of refractory materials is extensive, and many metallingical plants earry on their staff a refractories engineer.

The reason for the designation "acid" and "basic" is that such materials have an acid or basic chemical reaction at the working temperature of the operations. For instance, an electric steelmaking furnace usually has a basic hearth of calcined magnesite. This allows and requires that the molten slag covering the bath of molten steel must be basic in character, which in practice means it is tich in line and can absorb and hold impurities removed from the liquid steel during

the refining operation.

The discovery of successful basic retractories to be used in steelmaking practice was made by a young Englishman, Sidney Gilchrist Thomas, about 1875, and was one of the great inventions of the world, making possible basic open hearth and basic electric steel production, and also the basic Besseiner or Thomas process so widely used

in Europe.

Fluxes.—Among the raw materials used in process metallurgy are fluxes. Limestone is the most widely used, particularly for blast furnace operations, and burnt line is used a great deal in other operations. The functions of a flux are to unite with waste materials in the charge at the working temperatures and form a fusible, readily flowing slag which can be easily tapped from the furnace and removed. Calcium fluoride or fluorispar is another flux used in foundity operations, open hearth and electric steelmaking, and also in the production of aluminum.

and also in the production of aluminum.

Furnaces and Equipment.—The types of furnaces and equipment used in metallurgical operations vary tremendously. There are many kinds of blast furnaces. In the production of tin, lead, copper matte, and pig iron, for instance, the size and design vary according to the materials being treated, the fuels used, and the daily tomnage desired. An iron blast furnace is circular in cross section. At the bottom is the hearth or crucible in which the molten materials accumulate, metal on the bottom covered by the lighter slag. The time of tapping varies; slag may be removed every two hours, and the iron every four hours. The lines or design of the furnace vary with the kind of ore being treated. The daily tonnage output also varies from 5 tons to 1,600 tons, according to the size of the furnace and how it is blown or operated. The products of an iron blast furnace must all be either liquid or gaseous, otherwise the furnace would choke up and have to shut down

A copper blast furnace, on the other hand, is usually rectangular in cross section. A lead blast furnace is generally circular; the molten lead does not collect in the furnace but flows contin-

uously

The products of these furnaces may be used

as such, but in general have to be refined. For instance, lead is treated in large kettles, as they are called. Progress in and ento steel in various ways by melting with steel scrap and refining in open hearth furnaces, or by blowing air through it in Bessenici converters. Tool steel is usually made by melting carefully selected scrap steel with some pig iron in electric furnaces and refining under the proper slags. In all these stages of the refining operations, many varied and particular types of Jurnaces are employed.

For the further working up of the materials, the metals are melted in critebles, reverberatory furnaces, cupolas, open hearth furnaces, or electhe lumaces, then they are cast into the required shape, with the use of many special types of equipment particular to foundries, varying in accordance with the kind of castings being produced, such as magne aum alloys, aluminum alloys, brass or bronce, cast non, or the many varicties of steel. Or again, the metals may be east into ingots and tabricated into a great variety of tolled or forced shapes, with the required variety of heating turnaces and torging equipment, such as hammers or presses, drop hammers or forging machines. In regard to rolling mills, there are a great many different kinds turning out sheet, strip, bars, rails, plate, or structural shapes. Other types of nulls produce pipe or scamless tubes, while different kinds of equipment are required for cold rolled sheet, estruded bars and shapes, or cold rolled bars. Then again there are the special drawing machines for producing wire, some of them small in size, while others are assembled in groups and cover a great deal of

All such equipment requires the trained experience of mechanical and electrical engineers for design and operation, and the metallurgist must be able to understand their work and co-

operate with them

In addition to these types of equipment, an entirely different approach is seen in the field of wet metallurgy, which is closely akin in its methods to the work of the chemical engineer In such cases the ores or raw materials are usually finely ground and concentrated by various methods such as flotation. Then the concentrates are often rotated or calcined to put them into suitable condition, after which they are leached with various solutions, such as dilute acids or solutions of various salts. The solutions containing the metals are then filtered and subject to precipitation, or the metal salts may be crystallized from solution, after which the precipitates or crystals may be again dissolved and the solutions subject to electrolysis in special cells.

Summary. This brief presentation of metallurgy attempts to show what a broad field of work is covered by the metallurgist. It gives an explanation of why men specialize in their own small part of this field, and why large companies devote all their activities to the metallurgy of a particular metal, or even to one actively connected with one metal, such as the production of brass or bronze castings, or the manufacture of wire rope. It also shows that there is ample scope for the inventive genius of mankind and for efforts in the line of administration, business, and production. See also articles Aluminum; Blast Eurnace; Copper; Copper and Brass Industry; Electric Furnaces; Flectrochemical inventives; Flectrochemical is also on the separate metals.

METALS 703

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METALS. The elements which compose all natural objects are divided by chemists into two classes, metals and non-metals. Formerly the classification was based on physical propeities, and the metals were then defined as those elements which were opaque, had a metalhe luster and were good conductors of heat and electricity; now the division is made on chemical properties, upon the foundational principle that the hydroxides of metals are bases, while the hydroxides of non-metals are acids. However, no sharp line can be drawn between the metals and non-metals, since a few of the elements will classify as either. Some metals have a high specific gravity, but lithium, sodium, potassium, etc, float on water, and in general the metals of highest specific gravity are least active chemically. Of the 83 recognized elements, 61 are regarded as metals

The following classification of the elements usually placed in the group metals is that arising

from the application of the periodic law (qv).

Class I Two sub-classes (1) Lithium, sodium, potassium, rubidium and caesium, (2)

copper, silver and gold.

Class II Two sub-classes (1) Calcium, strontum, barum and radium; (2) glucium (or beryllium), magnesium, zinc, cadmium and

mercury

Class III. Three sub-classes: (1) Aluminum, gallium, indium and thallium; (2) cerium, lanthanum, neodymium, praseodymium, samarium, emopium and gadolinium, (3) terbium, dysprosium, holmium, yttiium, eibium, thulium, ytterbium, scandium, lutecium and celtium

Class IV Two sub-classes: (1) Titanium, zirconium and thorium; (2) germanium, tin

and lead

Class V. Two sub-classes: (1) Vanadium niobium (or columbium) and tantalum; (2) arsenic, antimony and bismuth.

Class VI Chromium, molybdenum, tungsten

and uramum.

Class VII. Manganese. Class VIII. Three sub-classes: (1) Iron, nickel and cobalt; (2) rhodium, ruthenium and palladium, (3) osmium, iridium and platinum.

A mass of any metal is considered to be composed of atoms arranged in molecules, and any change in the arrangement of the molecule means a change in physical characteristics Thus crystalline structure may be obliterated by rolling or hammering a metal and by the same means the specific gravity may be increased, since the molecules are forced nearer together

All metals with the exception of hismuth are lighter when molten than when cold. Bismuth, like water, reaches its greatest density just before solidifying. The relative specific gravi-ties of some common metals in the solid and in the liquid state are shown by the following table, compiled by Sir Roberts-Austen.

The fracture of a metal is not a distinguishing property but an evidential feature which gives much information about the manner in which it cooled, the presence of impurities, etc., and is of great practical value. Thus foundry iron is in many instances still graded and sold by its fracture, and in smelting copper and refining lead the decisive points in the processes

are determined by the fracture of test samples Slow cooling, as with chemical solutions, tends toward the formation of large crystals, giving a

METAL	Sp g of solid	Sp g of liquid
Iron (pig) Zinc Tin Copper Bismuth Silver Lead	6 95 7 20 7 50 8 80 9 82 10 57 11.40	6 880 6 480 7 025 8 217 10 550 9 510 10 370

coarse fracture, while a sudden cooling may prevent the formation of crystals and thus give a fracture of fine texture Ciystalline structure, which determines fracture, may be affected by repeated shocks or vibrations. In this way the wrought-iron chains on railroad cars to prevent accident in case of a coupler breaking may by the jolting of ordinary service become so crystalline as to break when needed. Very low temperatures, as shown by the experiments of Dewar, also affect in a marked manner the crystalline structure of some metals metal is fusible though arsenic sublimes at 356° F, it may be fused under the pressure of its own vapor When heated, metals show a red and finally a clear white color. The temperatures corresponding to these colors are approximately, incipient red, 975° F; dark red, 1290°, incipient cherry red, 1470°; clear cherry red, 1830°, white, 2370°; dazzling white, 2730°. The color of a metal depends on its selective

absorption of light waves of different wave lengths. Unless the light penetrates the metal, it is all reflected and the metal looks white. The selection of light rays may be from several parts of the spectrum; this is the case with copper which has a reddish hue Anything which increases the absorption deepens the color. This can be done by reflecting a ray of light many times from two or more surfaces made of a given metal Silversmiths and goldsmiths accomplish the same result by finely grooving a metal surface. Owing to this absorption of light by a metal the color of the light reflected differs from that transmitted Thus gold can be made so thin that some light will get through This light is bluish green, while in reflected light, gold appears yellow Silver is white by reflected light, while the transmitted light through silver foil is blue.

Malleability is the property that permits a metal to be hammered or rolled into sheets.

Ductility that which permits it to be drawn into wire Both are dependent on the tenacity of the metal, the latter more than the former. The relative malleability and ductility of the principal metals is as follows:

Order	Malleability	Ductility 7
1 2 3 5 5 6 7 7 9 10 11	Gold Silver Copper Platinum Palladuum Iron Aluminum Tin Zinc Lead Nickel	Gold Silver Platinum Iron Nickel Copper Palladium Aluminum Zue Tin Lead

Certain physical constants of some of the metals are shown in the following table:

Andrews of the second s			. 12	
METAL	Symbol	Atomic	Specific gravity	Melting point, "F
Aluminum Antimony Arsenk Barium Bismuth Cadmium Cassium Caltum Citum Chomium Cobalt Copper Dysprosium Etropium Gadolmium Gallium Germanum Glium Germanum Glium Gilum Gilum Gilum Lionum Indium Indium Lion Lion Lanthanium	Symbol Al Sh As Bt C3s Ca Ct Cc Cr Cb Cb Cd Gd Gd Gd Ho Hn Hn Hn Hp		Specific gravity 2 6 6 7 7 5 7 8 8 8 6 1 6 1 8 5 8 9 1 1 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	point, "F 1217 1166 15607 887 520 610 79 1490 4 1184 2768 2690 1984 * 22822 * * * * * * * * * * * * * * * *
Lead Lathum Luterum Magnesum Magnesum Magnesum Magneses Mercury Molybdenum Nedymum Nedymum Nohum Osmum Palladum Palladum Patassum Prascodymum Radum Rubdum Rubdum Samarnum Scandum Scandum Strontum Strontum Tatalum Trahum Trahum Trahum	Pb Lau g Mg Mg Mg Mg Mg Nd Ni b Obd Pt K Pr Rah Rb Rb Rb Rc Sag Stab Rt Ti Tro			6 31 367 * 1204 2300 - 37 4530 P 15 11 26 12 3900 P 4100 P 26 90 1 11 17 14 12 92 35 20 4170 2372 * 1760 207 1110 5160 * 576 3150 3250
Titanium Tungsten Uranium Vanadium Ytter bium Ytti rum Zinc Zinconium	Sn Ti W U Yb Yb Zn Zr	184 00 238 50 51 20 173 50 88 70 65 37 90 60	18 64 18 69 5 5 * * 6.9 4 15	5-130 2730 3130 * 2282 787 2732

^{*} Not yet determined. The interrogation point indicates that the figure quoted is approximate.

The mobility of the molecules of a metal is increased by temperature. Thus a coded nickel wire may be made absolutely straight by suspending a weight from one end and heating the wire to white heat by the flame from an alcohol lamp or Bunsen burner. Zinc at its melting point is brittle, but at a temperature of 150° is quite malleable.

Metals can occlude gases. Thus a given volume of palladium cooled from red heat in hydrogen absorbs 900 times its volume of that gas Hydrogen passes through red hot iron or platinum, and nascent hydrogen, assisted by atmospheric pressure will pass through a thin

plate of cold from as shown by Deville. A liquid metal can penetrate a solid, a bar of the rubbed with mercury absorbs enough in a very short time to become brittle. A solid metal may penetrate another when both are cold. This can be shown with plates of gold and lead rolled together and allowed to stand.

For further information about the different metals, see special article under the title of each, as Atuminum, Antimony, Iron, Lead, Shver, etc. Consult Friend, J. N. (editor), Textbook of Horganic Chemistry (9 vols, London 1914-17)

RICHARD FERRIS,
Faitorial Staff of The Americana

METAMERISM, in chemistry, that variety of isomerism in which chemical compounds have identical percentages of composition and also like molecular weight chemical compounds have the same empirical formula, but consist of different radicals united by an element (or a radical) that is common to them all, the compounds are said to be "metameric," and the property itself is called "metamerism." The common element that unites the radicals is usually oxygen or nitrogen. Good examples of metamerism are afforded by the compound ethers and amines. Dipropyl ether, methyl anivl other, and ethyl butyl ether, for example, all have the empirical formula Collino; but dipropyl ether contains two propyl radicals (Calle), methyl amyl ether contains one radical of methyl (CH1), and one of amyl (CsH1), and ethyl butyl other contains one radical of ethyl (C.H.) and one of butyl (C.H.), the two radicals being connected, in each case, by an oxygen atom. The structural formulæ of these respective compounds are therefore as follows

$$\begin{array}{ccc} \text{Dipropyl ether.} & \text{Methyl amyl} & \text{Ethyl-butyl} \\ & \text{ether.} & \text{ether.} \\ & \text{Call}_t & \text{Call}_t & \text{Call}_t & \text{Call}_t \\ & \text{Call}_t & \text{Call}_t & \text{Call}_t & \text{Call}_t \\ \end{array}$$

The following amines, which all have the empirical formula C₈H₆N, illustrate metamensm in which nitrogen is the connecting element

Propylamine Methylethylamine Trimethylamine

$$N \left\{ \begin{array}{ll} C_{3}\Pi_{1} & N \left\{ \begin{array}{ll} C_{1}\Pi_{2} & C_{2}\Pi_{3} \\ \Pi_{1} & N \left\{ \begin{array}{ll} C_{1}\Pi_{4} & N \left\{ \begin{array}{ll} CH_{3} \\ CH_{3} \\ \Pi_{1} & CH_{3} \end{array} \right. \end{array} \right. \right.$$

Metamerism may be regarded as a species of accidental isomerism. When metameric compounds are treated with reagents which destroy the bonds between the constituent radicals and the atoms (of oxygen or nitrogen) by which they are united, the several members of the metameric group that is so treated yield totally different products, because they contain totally different radicals.

In zoology, metamerism signifies the repetition of parts in an organized body, as in segmented worms, certain vertebrates, orthopods and lobsters. The meres or segments fall into two classes, those in which the meres repeat with no apparent change and those in which there is modification as the series progresses.

METAMORPHIC GEOLOGY, that branch of geology that deals with the causes and results of metamorphism (q.v.).

METAMORPHIC ROCKS, those rocks of either igneous or sedimentary origin which

have undergone sufficient heat and pressure to be altered into a different kind of rock. In this way limestone becomes marble, sandstone is changed to quartrite, and shale passes over into slate or schist. Metamorphic rocks are usually most abundant in regions of mountains where the rocks have undergone much folding and compression. See Marble, Quartriff, Metamorphic Rocks in the article on Rocks.

METAMORPHISM. When rocks of either igneous or sedimentary origin undergo sufficient change so that they largely develop new minerals, and become other types of rocks, they are said to be metamorphosed, and the process is called metamorphism. Such changes may be brought about in many ways One of the most familiar is the process of weathering (qv) by which the minerals of a granite, for example, undergo alteration, the quartz remaining behind as quartz, the feldspar altering chiefly to clay, and the soluble lime, magnesia, potash and soda going to the sea, the first two to form limestone, the latter to produce the salt of ocean water. Thus the complete weathering of a granite and the sorting of the products finally results in the formation of shale, sandstone and limestone. This phase of metamorphism is called katamorphism It is produced by the atmospheric agencies and results in simpler mineral compounds and rocks.

If on the other hand, a sedimentary rock be subjected to intense heat or pressure, or both, the minerals present recombine to form new minerals, usually more complex, which are better suited to conditions of heat and pressure. This phase of metamorphism is usually called anamorphism. In general usage, the term metamorphism is commonly restricted to what is here termed anamorphism, that is, to those changes due to heat and pressure. The term metamorphic rocks (q v) is wholly restricted to rocks which have undergone changes of anamorphic nature. Thus, for example, a shale which has resulted from the weathering of a grante, though it has undergone metamorphism in the broadest sense, is not considered a metamorphic rock.

The heat and pressure which cause metamorphism may be produced by compression and folding over large areas, in which case there is said to be dynamic or regional metamorphis; or they may be due to the intrusion of large masses of highly heated igneous rock (magma), in which case there is said to be contact meta-

morphism

Regional metamorphism results largely from pressure, heat is only incidental. The most common minerals to result are those which are flat like mica (qv), or elongated like hornblende (qv) These naturally develop in parallel arrangement with their smallest dimension opposed to the pressure, that is their larger dimension is at right angles to the compression This seems to be the easiest way in which such minerals can develop. As a result of this arrangement, such rocks split more easily in certain directions, just as wood splits parallel to the grain This is called cleavage, and is best manifested in slates (q.v.) and schists (q.v.).

Contact metamorphism, on the other hand, is due largely to heat; pressure plays a less important part. The changes at a contact may be

of several types The rocks may be simply baked or they may be actually fused. The minerals present may recombine to form new minerals. There may be much new mineral matter actually added from the igneous mass, as in the case of contact ore deposits, where ore minerals make up a large part of the contact rock Or the heat of the igneous mass may drive off substances already present, especially water and carbon dioxide. At most contacts these processes have probably all played a part The intensity of the metamorphism and the width of the altered zone depends on several factors, such as the size and temperature of the igneous body, the amount of the water or steam present, and the resistance of the enclosing wall rock A quartzite (qv) wall rock may be little changed, while a limestone (q v), because of its greater solubility, may be profoundly altered. An abundance of steam aids in producing a marked effect, since it readily works its way out through pores in the rock, carrying much mineral matter. Alteration produced largely by steam or hot water is termed hydrothermal metamorphism Changes produced by ordinary circulating waters are sometimes termed hydrometamorphism See CLEAV-AGE; GEOLOGY, MEIAMORPHIC ROCKS; ORE DEPOSITS Consult Van Hise, C R, 'A Treatise on Metamorphism,' (U S Geological Survey, Mon XLVII, Washington 1904); Leith, C K, and Mead, W J, 'Metamorphic Geology' (New York 1915); Leith, C. K, 'Rock Cleavage' (U. S Geological Survey, Bull. 239 Washington 1905); Grubenmann, U, 'Die Crystallinen Schiefer.'

METAMORPHOSES. Ovid's 'Metamorphoses,' or 'Transformations,' were published in the year 8 AD, when the poet was 50 years old They were finished just before the issue of the imperial order which consigned Ovid to banishment at Tomi on the Black Sea for the remaining eight years of his life. In consternation at the punishment which had overtaken him, he elsewhere tells us that he consigned to the flames his own copy of the poem. But other copies were already in the hands of his friends, it is to these that we are indebted for the preservation of the work.

The poem consists of 15 books in hexameter verse descriptive of the various transformations through which various men and women were conceived to have gone. In the conception of the Greeks almost every river, rock, spring, tree and mountain had attached to it the legend of some such wonderful metamorphosis. Thus the poplar trees are the weeping sisters of Phaethon; the laurel is Daphne; a spring is Arethusa; etc. The source of this multitude of transformations found in ancient legends is doubtless to be sought in the ancient conception of inanimate objects as animate Each rock and tree and hill with the Greeks and Romans was a personal being endowed with a spirit Thus the poplar trees and the fountain and the laurel were regarded as animate to start with; they had not merely become so by receiving the souls of certain men and women To the vivid imagination of the Greek the waving form of rustling tree or shruh, the moving mass of bubbling or falling water suggested life and individual spirit. The problem was to account for the present form. The inanimate objects represented as the result of transformations had, accordingly, been conceived as animate from the outset, and the stories of their transformations are merely later inventions devised to account for their primi-

tive conception as personal beings

Some 250 of the stories belonging to the body of Greek and Roman legend and mythology receive treatment in Ovid's work, which thus becomes a fairly complete treatise on the classic myths. Among the most important of these are the stories of Deucation and Pyrtha, Daphne, Phaethon, Cadmus, Semele, Echo, Narcissus, Pentheus, Pyramus and Thisbe, Ino. Perseus and Andromeda, Niobe, Procue and Philomela, Medea, Theseus, Seylla, Daedalus, Philemon and Baucis, Hercules, Orpheus, Adonis, Thetis

Relatively little space is devoted to the actual metamorphosis in Ovid's poem The transformation is simply the culmination of a story, generally one of some length. Thus after detailing with great fullness the adven-tures of the ill-fated Phaethon with the horses of Pheebus, the poet finally concludes by briefly tecounting the transformation of Phaethon's mourning sisters into poplar trees. So with the other stories, the transformation holds an in-conspicuous place, being simply the feature common to all. The different narratives are woven together most ingeniously. There is no break. Each is connected with the preceding and following by some natural link, so that we have one continuous narration from the transformation of the stones of Deucalion and Pyriha into men to the transformation of Julius Casar into the comet which appeared after his death By the poet's fiction, therefore, the treatment is made to assume the illusion of chronological sequence In the last books Ovid approaches the legends of the Trojan cycle and of early Roman history, gradually bringing the reader to the events of his own day.

With great artistic skill the poet varies the manner of presentation. The larger part of the stories are his own narration, but monotony is avoided by resort to other devices. Thus a number of legends are put in the mouth of Orpheus Others are recounted by the three daughters of Minyas to while away the time as

they sit at their spinning.

The 'Metamorphoses' is Ovid's masterpiece and has always enjoyed high favor. The poet's own faith in his work is indicated by the concluding verses of the final book, in which he gives free expression to his confidence in the immortality which he feels it has won for him: "Over the stars his name shall soar; as far as the Roman dominion reaches his work shall be read, and it shall live for all eternity."

The most recent translation is by F. J. Miller in the Loeb Library.

CHARLES E. BENNETT. METAMORPHOSIS IN ANIMALS, the changes which in many animals take place be-tween the time of birth and maturity. The causes are most probably changes of habitat, of seasons, of food and the acceleration in growth resulting from the approach of sexual maturity. Familiar examples are the change of the caterpillar into the butterfly, of the tadpole into the toad or frog.

In the frog and toad, metamorphosis is complete and thoroughgoing. The embryo on hatching from the egg has a large head and body, but no tail, in a tew days its tail grows out and it becomes a tadpole, when it is fish-like, but without this or limbs. With the growth With the growth of the tail, the external gills appear, and the mouth is formed, while the intestine becomes very long and closely coiled. The mouth is armed with horny, comb like plates, on which develop great numbers of microscopic teeth, which are shed continuously. In changing from the tadpole to the toad or trop, the body, including the skull and rest of the skeleton, and the viscera are made over anew, the external gills disappear as the lungs develop, the time teeth appear in the jaw, the intestine becomes short and straight, and the cicature instead of nibbling decaying leaves or dead animals feeds on living snarls and insects. Soon the tail becomes absorbed, finally the hind legs grow out. the gills disappear, the front legs bud out and the adult form is attained. While most amphibia pass through such a metamorphosis, in a lew torms, owing to the absence of water or other changes in the environment, development is direct, the metamorphoras being suppressed Metamorphosas may be retaided by cold and shortened by hunger, and in the amphibians or in insects the changes are greatest in modern and specialized torms, as frogs and toads

The metamorphoses of the butterfly is the most complete of those of all insects. The life of the insects is divided into four stages, that is, the egg, larva, pupa and imago or adult. During the larval and pupal periods the insect is, so to speak, a different animal from the adult The caterpillar is provided with big jaws and eats voraciously; in shape and structure it differs widely from the winged adult pupa or chrysalis is also different from the larva, and also from the imago; it takes no food and rests almost motionless. On the other hand, the butterfly has no jaws, while its maxillæ form a long coded-up tongue, beautifully adapted for probing the corollas of Though these changes appear to be flowers sudden, the internal alterations of cells and tissue which lead to them are gradual. From one to three days before assuming the pupa state the caterpillar becomes restless and stops eating. If a spinner it spins a cocoon, or if not it enters the earth to undergo its transformation into a chrysalis, or if a larval butterfly it attaches itself to some fixed object, as a free or fence. Protound changes now take place in the mouth parts as well as the nervous, muscular and other systems of internal organs.

But the changes are most marked in the flesh flies and their allies. At the end of the maggot stage, the internal organs are destroyed breaking up and forming a creamy mass, and the appendages and wings arise from minute internal masses of cells called "imaginal buds" which are present in the maggot. The body is thus entirely made over anew. But while the process of destruction of the larval organs and appendages goes on, there is also a constructive process, during which the organs of the adult state are being built up. It is thus evident that the sharp division of the life-history of the insect into larval, pupal and imaginal stages only applies to the external surface of the body The internal processes of development, on the other hand, form a continuous series of transformations between which is no sharp line of demarcation. Yet as a whole the form of the

larva, pupa and imago are kept distinct in adaptation to their separate environments and habits

Hypermetamorphosis.- This name is applied to the changes undergone by certain beetles (Meloe, Stylops, etc.), in which there are more than the usual number of larval and resting or pupal stages. Thus, in the common oil-beetle (Meloe) and in the blister-beetles (Epicauta), the larva hatches as a minute, active, triungulm creature which is a parasite in bees' nests, feeding on their eggs; it passes into a second larval stage, when it is grub-like, inactive, the body being thick, cylindrical, soft and fleshy, this passes into a motionless semipupa, and thus after molting assumes a footless larval form, it then transforms into a true pupa like other beetles. There are thus four distinct larval stages, besides the pupa and Now these stages correspond to the habits and food of the young beetle, and these supernumerary stages and marked changes of form are evidently due to changes of environment, of habits and of food, resulting in the atrophy of limbs in certain stages. This throws light on the causes of metamorphism in general.

No Distinct Metamorphosis in the Primitive Insects.—The wingless insects (Synaptera) do not pass through a metamorphosis And it appears, as first suggested by Fritz Muller, that the habit of metamorphosing is an acquired one. Thus in the more primitive winged insects, such as the cockroach, grasshopper, bugs, etc., metamorphosis is incomplete, the young differing mainly from the adult in not having wings. Also the most primitive arthropod animals, such as the horse-foot crab (q.v.), the spiders and myriapods, pass through

no metamorphosis

Metamorphosis in the Lower Animals.—The more specialized colenterates (Medusæ), the echnodeims, mollusks and crustaceans, as well as many worms, undergo remarkable changes of form (See Larva). The larva of the marine annelids is a top-shaped ciliated creature (trochosphere) entirely different from its parent. The marine mollusks pass through a larval condition (religes). The young of the sea-urchin, star fish and holothurians differ remarkably from their parents in being bilaterally symmetrical, transparent and free-swimming, they serve as scaffoldings from which the body of the adult is developed. The shrimps, etc, are hatched in a nauphus or six-legged form, and crabs in a zoca form

METAPHOR, a figure of speech expressed in a single leading word; a similitude—for example, "The man is a lion," is a metaphor; "The man is as hold as a lion," is a simile Metaphor is an ideal characterization or illustration which may be affirmed by one mind and denied by another, or affirmed and denied by the same mind at different times; it is a kind of comparison in which the speaker or writer rejects the circumlocution of the simile and attains his end immediately by establishing the identity of his illustration with the thing spoken of It is thus of necessity, when well conceived and expressed, graphic and striking in the highest degree, and has been a favorite figure with poets and orators and makers of proverbs in all ages. Even in ordinary language the meanings of words are in great part metaphors; as when we speak of an acute intellect or a

bold promontory all such words are in metaphor, and the language may be called metaphonical

METAPHOSPHORIC ACID. See Phosphoric Acid

METAPHYSICAL DETERMINISM. See Determinism.

METAPHYSICS (from Gr. Meta ta phusika, "after physics," alluding to the position of Aristotle's treatise on metaphysics in his works) Metaphysics and constemology (qv) are the twin sciences of the nature of reality and of our knowledge thereof Metaphysics seeks for the criteria of being, epistemology for those of tiuth As the truth is generally conceded to possess some peculiarly intimate relation to reality which is not found in the case of error, and as our sole avenues of access to reality are those of experience, be it sensory, rational, emotional or volitional, the boundary line between epistemological and metaphysical opinions is of the most obscure and wavering nature, so that a separate study of the two disciplines is exceedingly unprofitable. We shall accordingly shift our standpoint continually from that of one science to that of the other

Metaphysics is not a subject which one can study or refuse to study at will; whether it is explicit or not, there is always some criterion of truth, of reality, that permeates our barest common sense. This may be metaphysically inadequate, but must be metaphysical When I draw a distinction between a dream and an experience of waking life, between a truth and a lie, between a fact and an error, I am drawing a metaphysical distinction. When a physicist reduces the table before him to a vast aggregate of electric charges, or asserts the basic identity of time and space, or interprets light a transverse electromagnetic vibration, he is nothing if not metaphysical, for he is drawing a distinction between the appearance of things and their underlying reality. Even those who claim to be agnostics or sceptics in the professor's chair are tainted with metaphysics in their daily life, for the only agnosticism, the only scepticism which can free itself from all blemish of metaphysics is an agnosticism, a scepticism so complete that it does not even tentatively maintain any criterion of reality or unreality, of truth or falsity

We have accordingly three stages of metaphysics to discuss: (1) the metaphysics of common sense; (2) the metaphysics of the natural scientist; (3) the metaphysics of the technically

trained philosopher

(1) The Metaphysics of Common Sense.—The average philosophical layman, be he educated or not, believes that the wall he sees in front of him, the cane that he holds, the song that he hears are real, with an immediate and underived reality. He is confident that the wall, the cane, even the song would be the same with nobody to experience them. He is also confident that he exists, and that his existence is utterly independent of any experience he may have. Now, this view that the object is out there and I am in here, and that seeing is something which needs no analysis (for so the layman believes), works remarkably well providing I only see things that are so. It is, however, clear that in my dreams and other illusions I frequently see things that in some

manner are not so If seeing is an immediate relation between me and my object, what is my object when I dream of something which, in every common-sense interpretation of the words, does not exist?

This is obviously the highest common factor of metaphysics and epistemology, for it unites the fundamental questions of the two sciences, the question of truth and that of reality What is more, it is in essence the one cardinal prob-lem of both sciences, the great problem of error. The problem of error may be approached from two different angles, according as there are supposed to be real entities which form the objects of erroneous experience, or no such entities at all. In the latter case, experience must be interpreted as not essentially a subject-object relation. As we shall see, practically all the eather modern philosophers hold that erroneous experiences have objects. The second alternative is indicated in Spinoza and appears in the philosophies of Kant and Hegel.

(2) The Metaphysics of Natural Science.
Of course, science as such can have no peculiar metaphysics, for the truth is essentially one - unless we adopt the pragmatist attitude - and cannot be changed into a falsehood merely by looking at it through the spectacles of a particular discipline. Nevertheless, there is a certain conventional metaphysics which may be read between the lines of the majority of scientific textbooks, the habitat of which is the laboratory and the specimen-box. Though this may be traced to the Greeks, it owes its mear-nation in its present avatar to Descartes and Locke. Both these writers, who are conventionally called dualists, since they believe in the essential distinctness of mind and matter, are really rather what one might name ternatists, inasmuch as they posit between the self and its objects a third class of entities, the ideas, by the mediation of which the mind or self is aware of the outer world. Dreams differ from true waking experiences in that the ideas they contain have no realities corresponding to them. Modern science has turned the real universe into a world of movements of material particles, or of electric charges, without any intrinsic color or sound, and has relegated these latter qualities to the realm of ideas physical correlates of these ideas are, of course, particles or charges in motion By the mediation of the nervous system these particles or charges and their movements are supposed to produce certain alterations in the brain -- Descartes considered that they were in the pineal body, while the advance of modern science has placed them in the cerebral cortex - which have as invariable concomitants certain ideas or ideational processes. It is these that form the sole direct object of human inspection.

This theory is perfectly successful in explaining error, but remarkably inadequate in accounting for anything else—any knowledge, that is, which is not a mere accidental blundering belief. The situation is quite analogous to that of a man gazing at the cover of a book and trying to know what is inside. This knot or rib in the cloth may cover an exposition of this or that theory, but if the book is permanently locked up, and is opaque, we can never know this. We consequently find that at the very beginning additions and modifica-

tions were made in the theory. These, how ever, belong to

(3) The Metaphysics of the Technical Modern philosophical tradition Philosopher may be said to commence with Descaites Accordingly, he is the first man with whom the metaphysical issues of the present day receive the division and treatment with which we are We have seen that he divided the lamhar world into separate realms, apparently of mind and matter, but really of soul, matter and ideas Nevertheless, he saw the difficulties of the problem of error and tried to give it a more adequate solution than that pertaining to the conventional philosophy of natural science. As the founder of modern mathematics he tried to introduce mathematical criteria of truth into metaphysics, and so he starts with the proposition, "I think, therefore, I am," the denial of which he regards as self-contradictory in the same sense in which "2 has a rational square root" is self-contradictory. Having thus obtained the existence of the self, he goes on to demonstrate that God exists. "I have an idea of a most perfect Being, and this idea can only come from the Being with the one perfection my idea lacks, that of existence" Once he has got this Being, Descartes asserts that our knowledge of matter receives its guarantee in the honesty of God. This relieves the difficulty we encountered in the metaphysics of the scientist, the difficulty of bringing ideas and their objects into relation, but it is not by any means completely satisfactory. If God is honest, how can we make blunders? By failing to have our ideas clear and distinct, says Descartes But how can an honest God permit vague ideas? This involves us in the interminable and funtless controversies concerning the relative power and goodness of God which were so characteristic of the mediaval schoolmen at their worst

Descartes' philosophy thus involves a Deus ca machina. His followers, without exception, laid far more emphasis on this phase of his philosophy than he himself. In the systems of Genlinex and Malebranche, God becomes the agent causing every change in mind and matter, who for each change in the one wills that there shall be a corresponding change in the From this Occasionalism it is but a step to the montant of Spinoza, for whom mind and matter are but two among an infinite number of aspects of the one reality, God. From another standpoint, the entire world is the content of intellection, without the mediation of the Cartesian and Lockean "ideas." Spinoza retains the logical, mathematical, intellectualistic standards of truth and knowledge which were set up by Descartes, but he has also a mystical, emotionalistic view of the nature of reality, in that he believes that this is most truly perceived through the Intellectual Love of God

The Deus ex machina survives in the views of the next great continental philosopher, Leibnitz. Instead of the two substances, mind and matter, of the Cartesian tradition, he supposes an infinity of substances, the monads, all par-taking to some extent of a mental nature. In place of calling upon God's continual intervention to keep these experiences in accord with the facts, Leibnitz supposes that at the Creation the Lord forcordained that all these many experiences should keep time, just as two perfect clocks, wound up and set together, will agree on all subsequent occasions until they run down It will be seen that the problem of error appears in the philosophy of Leibnitz almost in its

Cartesian form

Leibnitz regarded the monads as possessing ideas of various grades of clearness and distinctness, and believed that matter was made up of those with the vaguest ideas. Because he considered matter to be of the nature of mind, Leibnitz is called an idealist, and is classed together with Berkeley, whom we shall next consider. By observing the vast distance that separates the philosophies of these two men, it will be possible to see how little content inheres in this term, which, with its contradictory realism, has been singled out by a certain American philosophical school as the index of a grand dichotomy of all philosophical systems.

Berkeley belongs to the British empiricistic tradition. His immediate philosophical ances-Unlike Locke, however, Berkeley tor is Locke saw that no object not directly given can furmsh a test of empirical reality, nor an aid in its explanation. Accordingly, his world consists of selves and their ideas or sense-data. This does not mean that he rejected natural science, but that he insisted that all its propositions were capable of expression in terms of ideas. Such ideas as are not immediately given to any person he considered to reside in the mind of God, one of whose functions it becomes, to put it crudely, to watch things when nobody is looking and to see that they do not vanish away. However, it will be noticed that an idea in the mind of God which is not experienced by us is as mert, remote and useless from an explanatory point of view as a bit of matter Furthermore, the self apart from its ideas does not appear to play any great part in knowledge. Given an experience, nothing more seems to be added by the adjunction of the self. For these reasons, the next successor to the British tradition, David Hume, rejected both the Berkeleyan matter - thinking God and the soul as a specific entity, and interpreted the world purely and simply as an aggregate of sense-data.

We thus see the contrast between the natural-scientific and the Humian view of the universe, for the naïve scientist, a bit of experience is really an aggregate of atoms in motion, whereas for Hume an atom in motion would have to be interpreted in terms of bits of expossessed Unfortunately, Hume neither the scientific knowledge nor the logical mechanism to carry out this process in any but the crudest and most schematic way, and his philosophy of space, time and causality is in detail as bare and inadequate and unsatisfactory as any yet devised. Recently, however, Bertrand Russell, who is essentially a Humian in spirit, though he adopts the independent nature of the soul as at any rate a plausible hypothesis, has developed a treatment of these subjects, and of many other allied ones, which is at once scientific and at bottom after the manner of Hume. Matter, for instance, is treated as the system (Hume would have erred by saying "the sum") of its appearances; an atom or electron becomes a class of sense-data or a relation between them, or something of The scientific analysis in this general nature terms of atoms and electrons is recognized as valid, but as based on a deeper analysis into

the experiences out of which atoms and electrons are artefacts.

This recrudescence of British empiricism, however valid its opinions and valuable its results may be, is off the main stream of philosophical development during the latter part of the 18th century and the entire 19th. This main stream has its source in Kant, who, to continue the metaphor, marks the junction of the currents of British and of Continental thought. What is most distinctive in the thought of Kant is his definite and final occupation of the standpoint of epistemology, as the true ground for the determination of the problems of metaphysics Now in so doing, Kant is making thought the measure of reality, and this seems to be only repeating the judgment of Spinoza. But there is a great difference Kant declines to accept Spinoza's doctrine of thought and reality. The real is more than the con-tent of thought. In fact Kant returns to the ancient intuition of thought as formal, and the real as in some sense its correspondent. was also the tradition of Locke and his school, from which Hume departed, as we have seen, with a result that is often called scepticism. Now the history of Kant's thought shows that, while he clung to the belief in the mere formal character of thought, his tendency was also strongly in the direction of scepucism. Moreover it was on account of his failure to completely achieve what he calls his Copernican revolution, and which was in fact a reaction toward a constitutive doctrine of thought, that he was never able, during the whole of his critical period, to reach a satisfactory conception of the relation of thought to reality. Had Kant completely achieved the mental revolution he proposed, the result would have been, that in epistemology he would have asserted the doctrine of Spinoza, the identity of the real with the content of thought. The knowable world would thus have been identical with the real world and Kant would have escaped the dualism between knowledge and reality into which he actually fell. Kant also denies the univer-sality of thought; at least in the ontological sense. The thought that functions epistemologically is my human relative thought which can only pronounce judgments that are subjectively valid for me, but have no ontological value for reality. The Kantian metaphysics is a corollary from his epistemology. What Kant calls critical idealism is first an epistemology, secondly a metaphysic. As an epistemology it teaches that my thought is constitutive for me; that is, that its content is valid for my subjective connation. It gives me a world, in other words, in which I can work out the practical issues of my life, but it does not give me the world of real things in themselves with respect to which my attitude must be one of renunciation. As a metaphysic critical idealism simply carries its program out in the field of ontology. The presumption of the identity of what is thought with the real cannot be carried out objectively. Kant's metaphysics is therefore necessarily negative. Thought is able to complete itself ontologically, it is true, but the ideals it reaches have no other than subjective Their hypothetical content can never be identified with the real, and the Kantian is per force obliged to represent the whole ontological region as an indeterminate X and to look for

the satisfaction of his wants to extra-metaphysical forces. These he finds in the domain of cthics.

In Hegel we have also an example of a thinker who approaches metaphysics along the epistemological way But Hegel is a much more thoroughgoing thinker than Kant starts no doubt with the Kantian traditions in mind and his first great task, the development of his logic, is formal But Hegel is not a formal thinker, in the sense that he divorces content and form Thought is formal. This Hegel is not a final to confess, but it is also problemed. ontological At the same time there are no outlying realities, like the Kantian things in themselves. How is this? Are we to have the speciacle of a lapse into Spinoza? Our apprespectacle of a lapse into Spinoza. Our apprehensions are ungrounded, for Hegel asserts calmly that the form creates the content. Hegel asserts the identity of thought and reality in the sense that the real is, and is only, what the thought thinks it to be. It is the real by virtue of the thought thinking it to be. This by virtue of the thought thinking it to be sounds like a dangerous kind of subjectivity, till we learn that by thought Hegel means, not my thought or yours, as simply my or your intellectual function, but the thought that is universal and that thinks the universal So much for Hegel's epistemology. In Hegel's system epistemology and metaphysics are simply two aspects of the same thing. In epistemology we have the system logically conceived; that is in view of the process which the finite thought of the individual must pass through in order to apprehend it; whereas in the metaphysics we have the system presented in its unity as a self-completing whole. Epistemologically the dialectic is the movement by which results are achieved; metaphysically it is the Divine Spirit of the system as a whole Error is accounted for precisely by the disparity between individual and universal thought.

One of the most remarkable aspects of the metaphysics of the past century is the strong voluntaristic or emotionalistic trend which is to be observed among writers of the most dif-ferent philosophical ancestry. Schopenhauer, though in many ways a follower of the Kantian tradition, interpreted the course of events as the manifestation of a world-will, which performs the functions of the Kantian thing-initself. This will manifests itself in man as will in the ordinary sense, while in matter it is seen as force. A view which displays an analogous voluntaristic or rather activistic trend, though in every other respect most unlike that of Schopenhauer, is pragmatism, the chief exponent of which was the American philosopher, William James. This view states that the truth of a theory or the reality of a system is not merely determined but constituted by what is in some sense the ease with which it can be applied and the value of the results of this application. A similar position is that of Henri Bergson, who maintains that the analysis of science yields us only half-truths, while the real nature of the world is shown to us by intuition, which exhibits it to us as the working

of a certain vital impulse.

There is no metaphysics at the present time which can lay claim to a general acceptance. The 19th century domination of all philosophy by the memories of Hegel and Kant is passing away, and the tendency of worshiping these

great men as philosophical demigods is wellextinct Their followers, numerous though they are, must dispute their realm with the modern critical adherents of the British tradition, armed with modern logic, mathematics and science, and with the pragmatisto-Bergsoman tendency

Before closing this article, let there be a word of caution to the reader against that facile metaphysical criticism which depends on labels. We have already seen that the line of cleavage between idealism, or the view that all things are either thoughts or their thinker, and realism, which asserts the existence of other entities, does not of itself mark one of the great philosophical dichotomies, Berkeley, the first typical British idealist, and Leibnitz, the idealist of the Continent, both, fall into the epistemological difficulties which are generally accepted as characteristic of realism, in that the problem of the relation between the knower and the known remains in what is essentially the Lockean or Cartesian stage. The distinction between spiritualism, which is almost a synonym of idealism, is that it regards matter as constituted of psychical material, and matemalism, which analyzes mind in terms of matter, is similarly not a touchstone to the real nature of the views which it denies. The only really satisfactory method of metaphysical criticism is by the careful individual analysis of each philosophical system according to its own concepts. See Epistimology; Philosophy; PHHOSOPHY, HISTORY OF, and the articles on the individual philosophers mentioned

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METASOMATISM. According to the United States Geological Survey, "Metasomatism may be defined as the process by which, through chemical interchange, a mineral or aggregate of minerals undergoes partial or complete change in chemical constitution. More simply stated, metasomatic ore bodies are formed when the ore substance replaces the took particle by particle, instead of filling already existing cavities. Replacement is frequently used as a synonym for metasomatism, and ore bodies, so formed are usually called replacement bodies. Replacement, unfortunately, is used loosely by some writers, to indicate cavity filling, and these authors use the term metasomatism and replacement in the same sense in which others use the term metasomatism. According to the most careful usage metasomatism and replacement are synonyms, and apply to ore bodies replacing the wall rock particle by particle "Metasomatic replacement" is then pleonastic.

METASTASIO, Pietro, pē-ā'trō mā-täs-tá'zē-ō (properly Pietro Trapassi), Italian poet: b Rome, 13 Jan 1698, d Vienna, 12 April 1782. His poetical talents were early displayed in improvisations, and often he diew about him a crowd to listen to some versified narrative. The jurist Gravina, who thus accidentally became acquainted with his talents, took him under his protection, called him (by an Italianized translation of his name into Greek) Metastasio, paid great attention to his education, and on dying On 15 in 1717 left him an estate of \$20,000 April 1718 he was received into the Arcadian Academy with the name of Artino Corasio, and in 1720 entered at Naples the office of the attorney Castagnola, who discountenanced literary work, and kept him severely to the law He wrote anonymously 'Gli Orti Esperidi' (1722) but the authorship was soon revealed, and Metastasio left the lawyer's office, studied further, and wrote a series of musical dramas, or melodiamas in the true sense, which were set by leading composers and given with great success In 1730 he settled in Vienna as court poet, and there in 1730-40 wrote his best works, 'Demetrio,' 'Issipile,' 'Demofoonte,' 'La Clemenza di Tito,' 'Attilio Regolo.' In the consideration of Metastasio's rank as a poet, his work must be viewed not absolutely, but with regard to its original environment, as done in collaboration with a composer, and rendered by great artists. He wrote, too, for the predominantly vocal system of Italian musical drama; and with this his poetry fell into comparative neglect His writings have been praised by so good a critic as Symonds for excellent versification, ease of diction, effective simplicity of construction and frequent imagery of the highest rank. His lyrical verse and criticisms are also of value. The best collected edition of his works is that of 1780-82 (Paris). Consult Massafia, 'Pictro Metastasio' (1882); also Lee, 'Studies of the 18th Century in Italy' (new ed., 1908).

METASTASIS (1) in medicine, a change in the seat of a disease, attributed to the translation of morbific matter to a part different from that which it had previously occupied, or to the displacement of the irritation. Mumps is a disease peculiarly liable to induce metastasis. In adult males the inflammation often goes to the testicles, producing orchitis, and in adult females to the breasts or ovaries, in the latter case ovaritis. Mastoiditis often results in similar shifting of the inflammation by the travel of blood clots, and the inflamma-

tion may reappear in any of a dozen places. (2) In botany, a change produced upon a substance designed for the nutriment of a plant, to make its assimilation more easy. Thus, when the starch formed in the leaf of a potato has to be transferred to the tubers as a depot of nutritial material, it is first changed into a soluble substance—glucose. See Metabolism

METATE, the stone implement on which grain and other substances, more especially corn, were ground before the discovery of America and are still ground throughout the territory of the United States occupied by the Pueblo Indians, and in Mexico, Central America and much of South America, more especially the west coast See Mortar

METAURUS, me-tâ'rŭs, or METAURO, mā-tow'rō, Italy, a river in the Maiches, which flows northeast past Saint Angelo in Vado, and falls into the Adriatic, southeast of Fano; total course, about 50 miles. It is noted for the victory gained by the Romans under the consuls Claudius Nero and Livius Salimator near its banks over the Carthagimans under Hasdrubal 207 B C

METAVOLTINE. A sulphur-yellow mineral occurring in aggregates of hexagonal scales at Madeni Zakh, Persia. Dichroic Hardness, 25, specific gravity, 253; composition. Sulphuric acid, 46.90; sesquioxide of iron, 21.20; protoxide of iron, 2.92; potash, 9.87; soda, 4.65; water, 14.58. Much of the mineral called misy belongs to this species.

METAYER, mē-tā'yēr, Fr. mā'tē'yā' (L. Latin, medictarius), a name given in France to the cultivator of a métairie or farm who reserves for limself one portion of the produce as the price of his labor and gives the proprietor the other, which represents the rent of the land after deducting what is necessary to keep up the stock. The greater part of the center and south of France, and almost the whole of Italy, is cultivated by métayers, who are in general upright, economical and industrious. This system of farming on shares, usually half and half, is extensively practiced in the southern United States where both white and negro share croppers cultivate tobacco and cotton acreage. The introduction of modern farm machinery and the population trend to urban life will no doubt reduce the number of tenant farmers. See Agriculture in the United States—Share System.

METAZOA, one of the two great sections into which Huxley divides the animal kingdom, the other being the Protozoa. The Metazoa embrace all animals composed of more than a single cell, that is all that develop through eggs or ovum The *Porifera* or sponges are the lowest of the Metazoa. See Anatomy, Comparative; Protozoa

METCALF, William, American steel manufacturer b Pittsburgh, Pa, 1838; d 1909 In 1858 he was graduated at the Rensselaer Polytechnic Institute, Troy, N. Y, and from 1860 to 1865 supervised the manufacture of Rodman and Dahlgren guns at Fort Pitt, Pittsburgh In 1868 he entered the steel manufacturing field and in 1898 organized the Bræburn Steel Company, of which he was president for 11 years. It is said that Metcalf made the first crucible steel in America. He was president of the

American Institute of Mining Engineers in 1881 and of the American Society of Civil Engineers in 1893. He published Steel—A Manual for Steel-Users (1896).

METCALFE, Sir Charles Theophilus, 1st Baron, English Indian and colonial administrator. b. Calcutta, Jan. 30, 1785, d. Malshanger, near Basingstoke, Hampshire, England, Sept. 5, 1846. The son of a major in the Bengal Army and educated at Eton, the 15-year old boy sailed back to India in 1800, a writer in the East India Company's service. Four years later, he became political assistant to General Lake during the Mahratta war. Several increasingly important appointments followed. In 1822 he succeeded his brother in the baronetcy, and five years later obtained a seat on the supreme council. First governor of the new presidency of Agia, in 1835 he succeeded Lord Bentinck as provisional governor general of India. Resigning in 1838, he was appointed governor of Jamaica. Illness compelled his return to England in 1842, but the following year he went to Canada as governor general. A malignant disease compelled his retirement in 1845 when he was awarded a batony for distinguished service.

METCALFE, Samuel L., American physician and scientist: b. near Winchester, Va., 1798, d. 1856 In 1823 he was graduated in the medical department of Transylvania University; established a medical practice at New Albany, Ind., and visited England in 1831 Upon his return to his native country, he made a geological tour in Tennessee, North Carolina and Virginia Later he settled in New York where he took up scientific work. He published Narratives of Indian Warfare in the West (1821); A New Theory of Terrestrial Magnetism (1833); Caloric: Its Mechanical, Chemical and Vital Agencies in the Phenomena of Nature, 2 vols., 1843 (2d ed., 1859).

METCHNIKOFF, Elie, Russian bacteriologist: b. Kharkov, Russia, May 15, 1845, d. Paris, France, July 15, 1916 Following his education at Kharkov, Metchnikoff studied at Giessen and Munich, and in 1870 he was appointed professor of zoology at Odessa. He held this post until 1882, when he resigned to devote himself to private researches into the anatomy of invertebrates. It was while working at lowly organized forms of life such as sponges that he first made the observations which constituted the basis of all his subsequent work. In 1888 he had attracted the notice of Louis Pasteur, the founder of the famous Pasteur Institute for the treatment of rabies, in Paris, and he was invited to become one of Pasteur's associates. In 1895 he succeeded as the director of the institute, a post which he held to the time of his death. In his study of longevity, Metchnikoff came to the belief that it should not be uncommon for persons to live to the age of 150 years. He found every indication that the human mechanism was calculated to last far longer than it actually does. His researches showed among other things that animals which had no large intestines lived to an advanced age, particularly birds, which preserve their youthful agility and spryness to the end of their long span In the case of human beings, he found that even among those whose sufferings were terrible, there were few who wanted to be put out of their agony by death. They all wanted to live. If the

normal specific longevity were attained by human beings, he believed that old and not degenerate individuals would lose the instinct for life and acquite an instinct for death and that as they had fulfilled the normal cycle of life, they would accept death with the same relieved acquiescence as they now accept sleep. On his seventieth birth-day, in 1915, Professor Metchinkoff received a present of a golden book, forming a unique record of the latest scientific researches, signed by men of science of the day. Although there was much controversy in the scientific world regardmg his original ideas, he was fully recognized as one of the most enument bacteriologists. In 1908 the Nobel Prize for medical research was divided between the late Dr. Paul Ehrlich, of Berlin, and Professor Metchinkott. The \$20,000 which he thus received he devoted entirely to the furtherance of his scientific researches. Personally he was not well off, and throughout his long life sacinficed all but the plannest living necessities to the cause of science. He was the author of a number of books including Lectures on the Comparative Pathology of Inflammation (London 1893); Immunity in Injective Diseases (New York 1905); Istude sur la nature humaine, essat de philosophie optimiste (1903) lenglish translations of his lectures are The New Hydiene (Cheago 1907), The Nature of Man (New York 1910) He edited. with Sacquépée and others, Medicaments microbiens (1909) Consult Annales de l'Institut Pas-tein (Paris), and Slovson, E. E., Major Prophets of Today (Boston 1911).

METELLA, Caecilia, daughter of Metellus Creticus and wife of Crassus the Younger. Her tomb on the Appian Way about 2 kilometers from Rome is one of the best known surviving monuments of the Augustan age. It is a circular structure of 05 foot danneter on a square base A frieze of garlands and bucranes circles the upper part. During the 13th century the tomb was incorporated in a fortiess which three centuries later Pope Sixtus V (1521–1590) tore down to bring it again into full view.

METELLI, më tël'i, a Roman family of the gens Caccilia. QUINTUS CAFCILIUS METELLUS MACEDONICUS defeated the Achaeans, took Thebes and invaded Macedonia, and received a triumph 146 BC. QUINTUS CAICHAUS METELLUS Numinicus rendered himself illustrious by his successes against Jugurtha, the Numidian king. He took, in this expedition, the celebrated Marius (qv) as his lieutenant; was soon recalled to Rome, and accused of extortion and ill management, but was acquitted of these charges. He celebrated a triumph at Rome 107 R.C. His son, QUINTUS CARCHAUS METELUS received the surname of Prus on account of the law which by displayed for his father when he love which he displayed for his father when he besought the people to recall him from banishment in 90 s.c. In 83 s.c. he joined Sulla, with whom, three years later, he was united in the consulship. Quintus Caechius Metellus Cre-TICUS conquered Crete, and reduced it to a Roman province in 67 BC. QUINTUS CAECILIUS METELLUS PIUS SCIPIO, the adopted son of Metellus Pius, in 52 a.c. was colleague in the consulship with Pompey, who had married his daughter Cornelia. Hence he exerted himself to the utmost to destroy the power of Caesar and strengthen that of his son-in-law. He commanded the center of Pompey's army at the Battle of Pharsalia, and thereafter fleeing to Africa

was defeated by Caesar at Thapsus 46 Bc. He died by his own hand.

METEMPSYCHOSIS. This ancient theory has at times been confounded with reincarnation. While both imply that man lives again, the propositions present radical differences. See also Transmigration of the Soul.

METENIER, Oscar, French novelist and playwright b Sancoins, Cher, France, 1859, d. Saint Mandé, 1913. At the age of 24, Méténier became secretary to the police commissioner of Paris, a post he held for six years. In his novels and plays he made considerable use of the first-hand experience of underworld life gained during this period. Among his novels, which in general are quite daring, may be mentioned La Char (1885); Bohêne bourgeoise (1887); Madame la Boile (1889); Barbe-Bleue (1887). His plays include En Famille (1887), La Casserole (1889); and Mademoiselle Fish (1896) adapted from de Maupassant's novel. In 1897, Méténier founded the noted Montmartie theater, Grand-Guignol, where he alternated short pieces that were either madly mirthful or gruesome. The Grand-Guignol soon became a theater specializing in sheer horror.

METEOR. The term is now restricted to cosmical bodies which enter the Earth's atmosphere from without, but until a century or two ago it included other phenomena such as halos, auroras and rambows. In some cases this makes it uncertain whether older writers were describ-ing true meteoric bodies or their trains, or some-thing purely atmospheric. The science of meteorology, which covers the phenomena of the Earth's atmosphere, does not include the study of meteors, this latter being a branch of astronomy sometimes called meteoritics. As now used the term meteor denotes any type of body, coming from space, which makes its presence known by rapidly moving across the sky, its head generally starlike but sometimes with an apparent disk, and often leaving a luminous streak or train of light along its path. This latter usually disappears in less than a second, but in rare cases may last many minutes. For descriptive purposes we have the terms shooting star, fireball, holide, and meteorite The first is a popular term denoting the average meteor; a fireball is a meteor at least as brilliant as the larger planets; a bolide is an exploding firehall; a meteorite is a firehall large enough to survive its fiery atmospheric journey and fall to the ground. All the other types are The word destroyed at considerable heights melcor is used both in the general sense to cover all classes, and in the restricted sense to denote what used to he called a shooting star, that is, the fainter and far more numerous members of the family, such as may be seen on any night.

It is difficult to separate the history of meteors and meteorites, so, while these latter are described in another article (see Meteorites), it is best to consider the development of ideas concerning their cosmical significance here. The fall of stones from the heavens is such an unexpected event, especially as it is usually accompanied by thunderous noises and often by smoke trains, that it must always have terrified primitive peoples, and later such events were doubtless recorded in official documents. Yet the oldest known record is that in the Book of Joshua, 10.11, where men fleeing from a battle are said to have been killed by "stones from heaven." We find that the Chinese, as early as 687 B.C., re-

cord the fall of meteorites and also describe fireballs and meteoric showers. Greek and Roman writers were less careful, some accounts being ambiguous. The oldest authentic one is of the large meteorite that fell in 467 BC at Aegospotami in Thrace. The oldest existing meteorite, the exact date and place of fall of which are known, is the one that fell on Nov. 16, 1492, near Ensisheim, Alsace.

In the next three centuries, a good many meteorites fell in Europe, but the reaction against superstitions of the Middle Ages led the scientists of the day to such great skepticism that they refused to face facts, in some cases. Per-haps the most notorious instance refers to meteorites in the 18th century the learned men of the day did not believe stones could fall from the skies, hence they affirmed they did not. Even the great French Académie des Sciences went on record denying that meteorites had an origin outside the atmosphere, despite accounts of falls by reliable witnesses, which were ridiculed, and the splendid pioneer work of Ernst F. F. Chladni about 1794. However, on April 26, 1803, a fall at L'Aigle in France, investigated by Jean B. Biot, finally convinced even the "philosophers," and the study of meteorites, as such, began. As for the more ordinary shooting star, two German students, H. W. Brandes and J. F. Benzenberg, in 1798 carried out simultaneous observations from two stations some distance apart Thus by the ordinary methods of triangulation, they were able to determine the approximate height at which meteors appeared and disappeared. Their average value for the points of disappearance was 98 kilometers. This proved they were far higher than clouds, but not at lunar or planetary distances It should be mentioned that Sir Edmund Halley had calculated a fireball path in 1719, so the methods were well understood, but still scientists neglected meteors almost entirely, and we may truly say that meteoric astronomy was born on Nov. 13, 1833, when the great Leonid shower appeared over America.

The Leonids.—This shower is estimated to have furnished 200,000 meteors for a given station between midnight and dawn, numbers of them brilliant, and many leaving trains. The terror excited among the masses of the population was great, the superstitious fully expecting the end of the world was about to come. However, there were enough trained men who saw the phenomenon for several to detect that the meteors really had a radiant in the constellation Leo, that is, a point in the sky from which they seemed to shoot away as spokes from the hub of a wheel. It was quickly seen that this radiation was merely a perspective effect and that the meteors, before meeting the Earth, were really moving in parallel paths. The position of the radiant fixes the direction in space from which the meteors come. As the radiant eventually was shown to be in the same position among the stars as seen from distant stations, this proved that the meteors came from space and did not originate in the atmosphere. From then on meteors have formed a definite branch of astronomy. Professor Denison Olmsted of Yale was the

Professor Denison Olmsted of Yale was the man who, at the time, made excellent observations on the Leonids and then concluded that what had occurred was due to the Earth's encounter with a swarm of particles moving around the Sun. John Locke, in America, in

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1834 proved that the August meteors had a 1adiant in Perseus; and Lambert A. J. Quételet, of Belgium, in 1836 discovered from a study of older records that they appeared every August on about the same date. George Adolf Erman m 1839 developed a method for calculating the oibit of a meteor swarm, Sears C. Walker developed another in 1841, and it is stated that Palm 11 L. Boguslawski had done so even car-her. Alexander C Twining's work in 1862 pushed the knowledge of the Perseid orbit much further But the truly great advances were made by Hubert A. Newton of Yale and Giovanni V. Schiaparelli of Italy. The former in 1863 proved from a search of ancient annals that we had been meeting Leonid meteors in great showers at least back to 902 Ap, though the date then was October 12. He showed that this change of date was to be expected, as our calendar is based on the tropical year, whereas the meteors would follow the sidereal year. He gave a table showing there were great showers in the following years 902, 931, 934, 1002, 1101, 1202, 1366, 1533, 1602, 1698, 1799, 1832, and 1833. From this he deduced a period for the stream of 33 25 years, and a shower was predicted for 1866 or 1867. (Since Newton's day, examination of Arabian, Chinese, Japanese, and Korean records have added showers in 935, 967, 1035, 1037, 1237, 1238, 1465, 1466, 1532, and 1566.) This prediction was fulfilled by an excellent shower in 1866, another good one in 1867, and a fair one in 1868. None of these, however, was anything like as wonderful as that in 1833,

Before following the Leonids further, it must be stated that Schiaparelli was able to prove to his satisfaction that most meteors met the Earth with nearly parabolic velocity, which is 42 kilometers per second. He further was the first to show that a meteor stream and a comet followed approximately the same orbit, this being done for the August Perseid meteors and Tuttle's comet, 1862 HI. He embodied his researches into the first reference book on meteors (see Bibliography), which remained the standard work for over half a century and still should be read by

all students of the subject

Returning to the Leonids, there was general expectation of another grand shower in 1809, but, shortly before, two English astronomers, G. Johnstone Stoney and A. M. W. Downing, undertook the calculations of the perturbations which the meteors had undergone since 1866. We should pause to say that the Leonal orbit is an clongated ellipse, its aphelion point being near the oibit of Uranus Meteors are scattered all around this orbit, which is really a cylinder several million miles in diameter, so that every November, when the Earth passes through, we meet at least a few Leonids per hour. For a certain space, however, meteors are very much more con-centrated, and this is roughly a tenth of the whole circumference. Hence it takes about three years for this denser part to pass, and we go through it either three or four times in succession. During these, greater showers occur. If we go, as in 1833, through the very densest part, wonderful showers are seen; if we miss the central mass and go through outlying regions of the stream, lesser displays are afforded. The calculations of Downing and Stoney showed that Jupiter and Saturn had so perturbed the densest part of the stream, as it passed near them, that it was probable it would wholly miss the Earth in 1899. In 1898 the preliminary increase was

indeed seen, and a good, if not spectacular, shower appeared, but the wretchedly poor display of both 1899 and 1900 more than vindicated the gloomy prediction. The 1901 Leonids, which had not been in position to be much influenced by the planets, furnished a good display, but nothing comparable even to that of 1868. The main stream being thus "lost," it was impossible to compute exactly what should happen for the next return. Actually, on the night of Nov. 16-17. 1931 an excellent display occurred, comparable to that of 1901, but in no other year of the pefield did really great numbers of Leonids appear; hence again the Parth had totally missed the densest part of the stream. As to the future, it is not possible to assert what will happen; it may be that perturbations will shift the deuse part of the stream back into such a position that we will again pass through it. The next return should be somewhere between 1961 and 1967; one cannot safely be more specific. The Leonids follow the same orbit as the faint Tempel's comet, 1866.

I. This should have returned in 1899 and 1932.

but careful search failed to detect it.

Other Showers. The Lynd meteors of April were proved by Johann G Galle in 1867 to follow the same orbit as Cornet 1861 1, and the Andromedes (also called Andromedids or Bielids) and Biela's comet were proved to have the same orbit almost simultaneously by Edmund Weiss and Heinrich L. d'Arrest in 1807. Many other possible connections of meteor streams and comets were then explored, one that of the Aquand meteors of May and Halley's comet being made probable though the observational data were very poor. In 1910 the final proof of this connection was given by Charles P. Ohvier, based on new and adequate data. In 1916, meteors appearing in May and June, coming to a maxinum on June 28, were proved independently by William F. Denning and Ohvier to be connected with Pons-Winnecke's cornet. In 1933 the splendid shower of Draconids, seen in Europe on Octoher 0, was proved to follow the orbit of Gia-cobini Zinner's comet. The possibility that this comet might furnish a meteor shower had been foretold some years before by Reverend Martin Davidson and by Denning. Lastly, the Tamid meteors of October, which do not give any "shower" in the popular sense, were proved to follow the orbit of Encke's comet by Fred L. Whipple. The other three annual showers, which furnish enough meteors to be worth noting here, the Quadrantids, Delta Aquarids, and Geminids, do not appear to have companion comets; the Orionids probably also are connected with Halley's comet. Some thousands of radiants of socalled mmor streams have been published. At present, it is imposeable to say what per cent represent real streams, though of course many do.

The Bielids furnished a grand shower on Nov. 27, 1872, a fine one in 1885, a good one in 1892, and an expiring effort in 1800. From then on few Bielids have been seen, either because the whole group has been so shifted that our Earth misses them, or because the meteors have been dispersed so that the cross section of the stream is far larger and hence the meteors more sparsely scattered. As to Biela's comet itself, it divided into two in 1845, the twins were seen in 1852 at the next return, but never since (see Comet). Both the meteors and the comet were doubless fragments of a much larger comet, and between them represent the last stages of its dispersal

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The cases of the two meteor or destruction streams connected respectively wıtlı Winnecke's comet and with Giacobini-Zinner's comet illustrate very vividly how our Earth may penetrate such streams on one or more occasions and then planetary perturbations shift the meteor orbits so they no longer intersect ours. For example, the perthelion distance of the first comet in 1819 was 0.77 astronomical units, in 1915 was 0.97, and in 1939 was 1.10 Meantime the orbital inclination changed from 10°.7 to 20° 1. The result was that by 1916 the comet's orbit was literally pulled far enough from the Sun to intersect ours and a fairly good display took place June 28 But the effects continued so that by the comet's next return in 1921, its orbit was wholly outside ours and a meeting with me-teors moving therein impossible. As a consequence, since 1916 only outlying members of the stream have ever been seen—nothing which could be properly dignified as a "shower."

For the second comet, the period of which is 659 years, Denning on Oct. 10, 1926, identified a fair number of meteors as from a radiant which could be connected with the comet. Then on Oct. 9, 1933, a gorgeous shower appeared, observed in Europe, but it was over before darkness had come in America; in other words, it lasted only a few hours. Evidently in 1926 the Earth penetrated the edge of the stream, in 1933 went through what was probably its center, but not again has the shower appeared. This shower may, however, reappear brilliantly about Oct. 9, 1946. The stream must be narrow. Both of the comets move with direct motion and belong to Jupiter's family. This means they are subject to great orbital changes. These latter have given us the chance to have meteor showers. In time to come we may hope that other streams may be switched into our path.

switched into our path
Frequencies.—The accompanying tables
will indicate the average hourly and monthly
number of meteors, and the average duration,
date of maximum, and richness of the principal
meteor streams. They are compiled from data
secured through the American Meteor Society
and other sources. They refer therefore mostly
to middle northern latitudes, to clear nights
without moonlight, and are for persons of good

eyesight

It will be noted that the second half of the year is much richer in meteors than the first, and that the same is true for the second half of the night. The first fact is due simply to the number and richness of the meteor streams intersected by the Earth in the respective periods The hourly duration comes as a result of the Earth revolving in 24 hours, so the zone where it is 6 A M is on the exact front side with respect to its orbital motion; while the zone where it is 6 pm is exactly in the rear. The meteoric apex is the direction in which the Earth is going at a given moment, defined by the tangent to the orbit. Our average orbital speed is 30 km/sec. (kilometers per second); that of meteors about 42 km/sec It is easy to see then that we, in a unit of time, meet many more than overtake us Also the relative velocities of the two groups will be 42 + 30: 42 - 30 or 72:17. When the Earth's attraction is added to the heliocentric velocities of the meteors, this ratio becomes 73:16 There is an important consequence when it is remembered that kinetic energy varies as the square of the velocity. Hence the ratio of the energy devel-

Table 1
Hourly Number of Meteors for Whole Year

Hour	Number of meteors per hour	Hour	Number of meteors per hour
6 PM 7 8 9 10	3 8 6 6 6 6 8 2 8 9 8	12 13* 14 . 15 .	11 5 13 1 14 4 15 0 14.8

^{* 13} hours equals 1 A.M

Table 2
Hourly Number of Meteors for Each Month

Month	Number of meteors per hour	Month	Number of meteors per hour
Jan	7 6 6 7 8 7	July August September October November December	10 16 10 13 11 12

TABLE 3

Name	Duration in days	Date of maximum	Hourly number of all meteors on this date
Quadrantids Lyrids Eta Aquarids Pons-Winnecke Delta Aquarids Perseids Draconids Orionids Leonids Andromedes Geminids	4 4 8 3 25 1 14 7 2	Jan 2 April 21 May 4 June 28 July 28 Aug. 11 Oct 9 Oct 19 Nov 16 Nov 20 Dec 12	28 7 7 7 27 69 * 21 21 21 23

^{*} Brilliant shower in 1933, return probable in 1946.

oped by a meteor coming from the apex at 6 a.m to that of one of the same mass from the antiapex overtaking us at 6 pm. is 73° 16° or about 20 1 Therefore we might expect more meteors to survive their passage through our atmosphere in the evening than in the morning hours, which is found to be statistically true. Also only larger bodies could survive during the morning hours

Orbits.—The heliocentric orbits of all meteors are conic sections with the Sun at the focus, but once the small body comes very near our Earth, the attraction of the latter becomes dominant, and so, in our atmosphere, the meteor moves in a hyperbola with the Earth's center as The visible path being described usually in a second or less, and its length being only a few score miles, for the average meteor it is practically a straight line. By using observations from two or more stations, made simultaneously on the same meteor, it is possible to compute the height at which it appeared and that at which it disappeared and the path length. If an accurate estimate of its duration is made, the velocity. and, by well-known methods, its orbit in space can be computed. Even when, as is usual, the velocity is poorly determined, by assuming parabolic heliocentric velocity we derive an orbit which is nearly correct in several of the elements. especially the inclination and the perihelion distance.

The necessary observations for determining a

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meteor's path have, so far, mostly been made visually During the past half century photography has begun to play a part, but even yet only the brighter meteors can be photographed. Visual observations consist in plotting the apparent path, as seen from each station, upon a star map Knowing how far the stations are apart and their latitudes and longitudes, the base line can be established. The ends of the apparent path being measured with respect to the stars give the right ascensions and declinations of these points Knowing the time, the altitudes and azimuths can then be computed. We now have, in principle, the case in trigonometry for solving a triangle when the base and adjacent angles are known It is impossible to state how many meteors to date have had their height computed, but one would be safe in estimating the number to be several thousand—quite enough to give good average heights both for certain magnitude classes and special showers. Results based upon photographs are very much more accurate than visual, but as yet are few in number. This is because faint meteors do not impress themselves upon the plates and also the faster then angular velocity, the more difficult it becomes to photo graph them Short-tocus lenses of large field of view and considerable aperture are best. With small fields of view, the chances for catching meteors decrease rapidly. At observatories where there are great collections of plates, no tably Harvard and Sonneberg, Germany, statistical studies have been made. At Harvard, Willard D. Fisher, in 1927, examined 71,454 plates and found 213 trails. A later search at Harvard, covering 8,077 plates taken with two instruments in 1930-1935 inclusive, netted 59 meteors, 159 more meteor trails were found on other series there for these same six years. Cuno Hoffmeister reports that at Sonneberg (about 1937) on 10,729 plates 51 trails were detected

By rotating a sector at high speed in front of a given lens, if a meteor is photographed, the path comes out as a line with a series of breaks thereon If a photograph at another station is available, then the heights and length of path can be computed and, knowing the timing of the breaks, not only the meteor's average velocity can be found, but the velocity in each part of tts path Pioneer work along this line was done by William L. Elkin at Yale from 1891 to 1910, and more recent work at Harvard by F. L. Whipple Interesting and important results, including proof of the slowing up of a meteor as it penetrates lower, have come from these programs, but observational and technical difficulties have not yet permitted results on any large scale.

Spectra.-When it comes to meteor spectra, attempts made in the latter part of the 10th century with small visual spectroscopes need scarcely be mentioned in view of the relatively greater accuracy of photographs taken with objective prisms. The work of one man, Peter M. Millman, is so outstanding that it alone need be mentioned. He has, however, enlisted the aid of many observers, so that the actual plates come from various sources. In 44 spectra discussed before 1941, he finds two groups which he calls Y and Z. In the Y group of 33 spectra the two strong H and K lines of ionized calcium appear; these are absent in the 11 in Z group. Also 25 of Y are meteors belonging to the four most prolific annual showers, while 10 of Z are certainly sporadic. Iron is found in 37 spectra. Be-

sides Fe, in order of number of cases are: Cat Ca, Mn, Mg, Ci, Mg', Si', Si, Ni, Al, and Na, This list of elements so far identified may be compared with those found in meteorites. It should be noted that all objective prism spectra are of very low dispersion and only prominent lines can be detected. As sporadic meteors form all of class Z, with one doubtful exception, it might well lead to belief in a considerable difference in structure between sporadic and the shower meteors, which latter seem to be debris of comets' nuclei. The term "sporadic meteor," as used here and elsewhere in this article, simply signifies that the meteor does not belong to one of the dozen or so best known annual streams, or those known

to be connected with some comet.

Mass The average increor seems to be an extremely small body. To determine its size or mass, we remember that the equation for kinetic energy is $E = \frac{1}{2} m v^2$, where m is the mass and w the velocity of the moving body. Further it can be shown that no body can strike the Earth with a smaller v than 11 km/sec, and it is nothing unusual for this figure to be as large as 70, 80, or even greater. It is then clear that v^2 , expressed in the usual units, is a great quantity, and E may still be large, even when m is very small. By knowing how bright a meteor is, its path length, its direction, and how far it is from the observer, then a good estimate of the amount of light energy it emits can be made. If all its E went into light, then our problem would be easier, but much goes into heat and probably also into other forms of energy. So assumptions are necessary. Accepting what seem the more probable, it is surprising to find that a meteor as bright as Jupiter may weigh only 4 grams, one as bright as Polaris 40 milligrams, and one just visible to the eye I milligram only Fletcher G. Watson computes that daily the mass of meteors which strike us amounts to 1,000 kilograms, the meteors ranging from - 10 to |30 magnitude. The latter are the smallest bodies which could move under gravitation and not be seriously affected by radiation pressure. He computes the true number of meteors, including those of +6 magnitude, or all visible to the eye, to be about 185,000,000 daily, while from 17 to +10 magnitude inclusive, or those visible in a small telescope, there would be 7 fullion. These estimates are larger than most earlier ones, but are based upon more modern data.

Heights. Meteors are mostly visible in that stratum of our atmosphere extending from 130 to 70 km from the ground. Exceptional ones may begin higher and penetrate lower. It is obvious then that the average meteor one observes will be 70 to 200 kilometers distant. How can such minute bodies be seen so far? The answer is that they are not it is the results of the energy they develop which we see. small, solid body rushing through even the tenuous upper atmosphere continually stukes air molecules, heating them, and they in turn heat the surface. Those in front of the solid nucleus are greatly compressed so it is surrounded by an envelope of incandescent gas, much larger than the body itself. It must indeed be remembered that a lot of heating takes place and perhaps even some loss of mass occurs, before the body becomes visible. As it rushes into denser air, the surface is continually sloughed off, and the average meteor will be wholly consumed above the 70-km. level. However, the resulting debris, METEOR 713d

gas and dust, add to the Earth's mass. The first stays in the atmosphere, the latter eventually settles. Traces can be found in polar snows and

even deep-sea dredgings.

The geocentric velocity of a meteor seems to determine the height at which it first appears, the greater the velocity, the greater the beginning height. The Leonids, 70 km/sec, Perseids 56 km/sec, are cases in point Results for 1932-1934 from work by the American Meteor Society (A.M.S.) give for Leonids $H_1 = 124$ km. (220) meteors) and $H_2 = 92 \text{ km}$ (232 meteors) Results by Weiss on 49 Perseids give $H_1 = 115$ km and $H_2 = 88$ km, respectively. A M.S results for sporadic meteors, observed on the same nights the sporadic ineteors, observed on the same nights the Leonids appeared in 1932–34, are $II_1 = 106$ km. (177 meteors), and $II_2 = 83$ km (183 meteors). V V Fedynski for the period 1930–1933, using a new method, derived for 62 Leonids $H_1 = 128$ km, $II_2 = 92$ km. These agree excellently with the A M S values as do those derived from the Value and the support of the second seco Yale photographic campaign by Elkin Ernst Onk, in his results of the Harvard-Cornell Metoor Expedition of 1931–1932, derives for what he calls "shower meteors" $H_1 = 103$ km, $H_2 = 85$ km., while for all meteors $H_1 = 95$ km, $H_2 = 82$ km He preferred to use harmonic means which appear in all cases to make H1 and H2 smaller than arithmetic means. Large meteors or fireballs penetrate often to 30 km.

Trains.-Most meteors leave an evanescent streak along their path which quickly disappears. The brighter ones often develop trains which last from one to many seconds. But exceptional meteors and fireballs occasionally leave trains which remain from a few minutes to even a couple of hours. Charles C. Trowbridge was the first to undertake serious researches upon long-enduring trains. His work appeared from 1906 to 1911 In this he proved that the stratum in which night trains appeared was that from 72 to 105 km, mean value 87 km. As for the cause of luminosity, he assigned phosphorescense of the atmospheric gases following preceding ionization, and showed that duration and brightness of the trains agreed well with laboratory experiments. He showed that trains were cylindrical and that they rapidly expanded; also that their drift furnished the means of finding the direction of winds in the stratum where they occur. Velocities for drift up to 300 km/hr were found, and it was further proved that thin layers, even when adjacent, had winds blowing in different directions and with different velocities. This means that the original train not only expands its diameter, but takes many forms, often fantastic in shape. In 1921, S. Kahlke, bringing the researches upon drifts partly up to date, showed that, for night trains over 80 km, a west wind was predominant over both America and Europe, but with a strong southern component for the former, a weak northern component for the latter. This he explains on the basis of the European observations being made in higher latitudes, on an average For day trains, between 25 and 80 km. height, for Europe he found an east wind, but there were too few cases for much certainty.

In 1941, Olivier published a much more extensive research on trains, having not only two more decades of results to handle, but finding in older literature numerous cases overlooked by the two investigators mentioned. Among his results are that for night trains the averages are:

 $H_1=102\,$ km., $H_2=74\,$ km., for day trains. $H_1=57\,$ km , $H_2=30\,$ km ,while the average velocities are respectively 175 km/hr. and 133 km/hr. This clearly indicates higher wind velocities at greater heights, on the average. It was also proved, in a few cases, that the winds were not merely horizontal but had strong vertical components. As sounding balloons have not yet been able to explore our atmosphere above some 37 km , it is obvious that train drifts furnish our best method for getting wind velocities in the stratum where they occur, and hence are of great value to meteorology. Excellent systematic work has been done since 1920 in this, as well as all other branches of meteoric research, by Russian astronomers.

The trains left by bodies visible in daylight average, as said, much lower. These indeed must largely consist of dust and smoke, which show up by reflected sunlight. The might trains, on the contrary, cannot be so illuminated, and hence their light must be inherent. Twilight trains may be composite. The great fireball of March 24, 1933, over Oklahoma and New Mexico left a long-enduring train from 100 km at the beginning to 25 km height at its end. It also dropped stone meteorites. Explanation of how such a train, particularly the lower part, remained visible is more difficult. The upper part was in sunlight but at an altitude at which day trains do not usually extend. The Sun had not risen for the lower, western end. Excellent photographs were secured of this train, as well as of

a few others before or since.

Under the head of telescopic meteors may be included all which are fainter than +6 magnitude. Every observer at intervals must see a meteor shoot across the field of his telescope, but the number of serious studies of the little bodies have been few. With regard to shower meteors, observations have been made at the maxima of the Perseids and Bielids particularly One interesting result by Adelbert Safarik in 1885 for the great shower of that year was that, in his telescope, he did not see many meteors fainter than +9 magnitude, and inferred that few smaller particles existed in the Bielid stream Fletcher G Watson in 1936 concluded that "from a preliminary study of strong meteor showers we are led to expect relatively few telescopic shower members." Öpik concluded that most sporadic telescopic meteors had hyperbolic velocities and hence come from space beyond the solar system.

J Hoppe in 1935 considered that he was able to prove that the daily variation extended to telescopic meteors. Some observers have been disposed to think such meteors are very much higher than the average naked-eye object, but this cannot be considered as proved, or indeed very likely.

Meteoric observations are particularly suited to amateurs, not indeed that they are easy to make, if plotting is part of the program, but because professional astronomers can spend but little time away from their telescopes. Hence much of the best work has been done by amateurs who were able to devote enough time to secure results over long periods. Outstanding among such men was William F Denning (1848–1931) whose work, over many decades, brought him deserved reputation. From about 1867 to 1872 there was an efficient association in Italy The Meteor Section of the British Astronomical Association has been active for many decades.

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doing most excellent work. The American Meteor Society, founded in 1911, had up to 1946 made about 400,000 observations, perhaps one third of the meteors plotted and fully recorded, the rest mostly planned comets. In the USSR since 1920 there has been the greatest activity among both professionals and amateurs, and excellent work of every type was done on meteors. In this connection I S Astapowitsch and V. V Fedynski have been leaders. There was a flourishing society in Czechoslovakia prior to World War II. There is also a society in Japan doing good work. Individuals and, at intervals, groups in many European and a few other countries have func-

tioned effectively. Despite all that has been done, there is a vast field for future endeavor. This can be along two lines devising new methods or instruments, or the attempt to use those we have in a more effective manner Nearly all previous work has been done in Europe and North America; the Southern Hemisphere has been relatively neglected. Statistical studies on such bodies as meteors should be made from many places on the Earth, widely distributed, if we would have full information. Then there are problems which can best be attacked at fixed observatories. Purmarily here would be wider application of photography to meteors, both to secure more accurate paths and heights, but most of all to settle the vexing question of their velocities. So far, due to obvious selection, the velocities secured must have been for slower moving bodies, and for the brighter ones We need accurate velocities for the more average meteors. Not until these can be derived instrumentally can the question of where they originated be settled. If their beliocentric velocity is over 42 km/sec, then they are from outer space; if less, then in general they originated in the solar system. There has been great controversy on this point, since, unfortunately, visual observations as to durations are perforce inaccurate and hence the derived velocities must be also Cuno Hoffmeister's important work, which appeared in 1924 and later, indicated that most meteors, omitting those belonging to the principal annual showers, had a strongly hyperbolic velocity. This was based on his interpretation of the daily variation. Also the majority of the 611 fireballs contained in the Von Niessl-Hoffmeister Catalogue (1925) give hyperbolic velocities. This latter result was strongly criticized by W. D. Fisher, and later by Charles C. Wylie, who believed that errors in the data are responsible for the high velocities found. Yet the results of the Haivard-Cornell Expedition, both by the rocking-mirror method, which is a partly instrumental one, and by another approach to the problem, according to Opik confirm the high velocities of sporadic meteors. But Watson (see Bibliography) indicates clearly that, as to the fireballs, he believes the large velocities erroneous. Whipple's work on the Taurid meteors, which Hoffmeister had worked out as an interstellar stream with high velocity, showed them to be connected with Encke's comet and really of low velocity. With all this disagreement among the best authorities, it is clear that no more important problem awaits solution than that of me-teor velocities. On the answer will depend how meteors must fit into the general evolutionary picture, and, as meteorites are the only extraterres-trial bodies we can analyze, they must furnish an important key to evolution.

The importance of meteor trains for studies of the upper atmosphere has already been explained. But determination of accurate heights and path lengths also give information as to the and path lengths also give information as to the temperature, pressure, and possible composition of the stratosphere. Nearly all of this work has been and will have to remain visual. We need more and better data. Studies of meteor rates help to determine the quantity of matter in space, and the density of meteor streams. In turn we are led to a better understanding of the composition and course of dissolution of comets. Up to 1946 no one had succeeded in getting the spectrum, by photography, of a meteor train When this is accomplished we will have direct information on the composition of our atmosphere at the heights in question. We need convincing parallax determinations of telescopic meteors to see whether they are taint because small though see whether they are rain because small though at average heights of are of average size at great heights. This last, like many other important problems, could be undertaken by amateurs with the proper training and instruments. All the societies mentioned welcome permeable that the education and constitutions are the classification and constitutions. sons interested in the subject, and generally furnish them with full instructions and aid in starting their work.

Origin. At present, all theories of evolution in the astronomical sense are in a state of flux, or, it would be better to state that no one has general acceptance among scientists. Such heing the case, it is impossible to be certain as to where or how meteors originated. We may say that shower meteors are debris of comet nuclei, but no one has any clear idea of how a comet came into being. II, as the writer believes with many others, most sporadic meteors come from space, cometary origin is scarcely credible. Are these tiny bodies indeed the building block of evolution or its debris? If anyone could explain how such small bodies could form out in space from molecules or atoms of gas, the former would be a very comfortable hypothesis. But no one ever has, so far as the writer knows. given an even partially adequate explanation of such formation. We are then driven back to the debris hypothesis, and at present it seems the more logical of the two. In this, meteors are debris of evolutionary processes by which large bodies are born into the embryonic stage. From here on some attain full growth, others are destroyed before, or perhaps after, reaching it. For every large fragment, say of asteroid size, there would be innumerable small ones, down to the dimensions of dust. These tiny particles, scattered in vast numbers through space, give us our meteors; those a little larger, and hence far less numerous, our meteorites. In historic times we have not met a body of the next order of size, that of a small asteroid, but our Faith is itself of moderate area, space is vast, and human history short. There is not the least reason to doubt such bodies do exist, and given time enough we shall find it out in a most unpleasant manner when one finally collides with us. We should hasten to add that some meteorites, the orbits of which have been calculated, originated in the solar system; we know of asteroids of short period which come inside our orbit. It heing the writer's opinion that the same processes, which formed them here, formed similar bodies in distant systems, the only question we need ask further is how the sporadic debiis es-caped into space. The answer would be rather

technical but should follow the type of explanation as to how a comet can attain hyperbolic velocity, which we occasionally find has occurred Studies of space absorption and the masses of spiral nebulae also lead independently to belief that mnumerable particles of meteoric size and larger exist beyond the confines of the solar system So while a complete account of why they are there cannot as yet be given with any certainty, we have many good reasons for believing they are there

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METEORITE, a solid mass which enters the Earth's atmosphere from without and survives its hery passage to fall upon the Earth's surface Previous to this encounter, a meteorite travels in an orbit which is a come section, our Sum being at one focus. Closely approaching the Earth, the latter's attraction adds to its heliocentuc velocity, hence it can be proved that the minimum velocity with which an outside body can strike us is 11 km/sec. (kilometers per second), while the maximum has reached perhaps as high as eight times this value. Just before collision, the temperature of the meteoric body would be that of a small airless planet at one astronomical unit from the Sun, or about 4°C, not near absolute zero, as is sometimes erroneously stated Entering our atmosphere, even in the tenuous upper regions, the body would be heated by collision with air molecules, the friction or heating becoming greater as it penetrated lower. And meantime a large gas cap would be formed in front, the gases therein being tremendously compressed, and carried along with it. The surface becomes greatly heated, and in fact melts and sloughs off, and eventually the resistance, due to increased air density, not only slows but virtually stops the body at a height of some 20 to 30 km. Having lost much or all of its cosmical velocity, from this height it drops down under the Earth's attraction. This explains why any meteorite, actually seen to fall, never penetrates deeply into the ground. The greatest penetrations known are only a few meters, while small meteorites are found lying on the surface; one fell upon lake ice a few inches thick without breaking it.

As the time of passage through the air is measured in seconds, heat has no chance to penetrate from the surface into the interior by conduction. The heating and melting are therefore superficial. While meteorites are doubtless warm when they first fall, accounts of their being extremely hot, or setting fire to vegetation, seem certainly exaggerated If they come at night, they are usually visible from a height of 120 km. or more, to 20 or 30 km.; below this, it is doubtful if many are seen. Some attain at their brightest the brilliancy of the full Moon, or even more when they burst or flare up. Such bursting is doubtless due to tremendous air pressure on their flore and for a reference of the second of the se front surfaces, plus sudden surface expansions A meteorite acts like a typical fireball while visible in its atmospheric path. The rapid passage through the air, which is violently disturbed,

often produces sounds like rolling thunder, artillery fire, or even explosions These are sometimes violent enough to shake houses. If the body comes during daylight, it is usually detected at lower heights and, by contrast, against the sunlit sky will not be so brilliant. It is accompanied often by clouds of smoke and dust, which debris at times remains visible for long intervals after the body itself has fallen. Some meteorites "explode" into many fragments; others fall in a single mass or at least only one is found. In the first case, fragments may be dispersed over an area of several square miles. When a meteorite is found, its surface to the depth of about a millimeter has a black, fused crust. This is, of course, due to the last melted material which was not brushed off by the air during its passage. Irons usually have pitted surfaces, the smaller depressions looking not unlike deep thumbmarks. When a meteorite has lain on or in the ground for a long time, larger cavities are formed by the removal of the less refractory materials through weathering. Stone meteorites, unless promptly found, are likely to be permanently lost. This is because they look not unlike ordinary rocks and they disintegrate rather rapidly. Irons, on the contrary, may survive for centuries and still be recognizable. Curiously, however, only one meteorite has been found embedded in ancient strata. This was in the Pliocene gravels of the Klondike. The history of meteorites is briefly touched on in the article Meteor, as the subjects overlap. As additional information, there is reason to believe that the (original) image of Diana at Ephesus, which "fell down from Jupiter," must have been a meteorite (see Stone Worship). Several Greek or Roman writers describe the fall of other stones from heaven, which were thereafter held in veneration. The Chinese record a fall in 644 B.C. The sacred black stone built into the Kaaba (qv) at Mecca, which may still be seen, is believed to be a meteorite. Despite the skepticism of 18th century scientists, a few me-

teorites which fell before 1800 were preserved
The German philosopher Ernst F F. Chladni in 1794 seems to have been the first eminent man to give scientific reasons for believing certain metallic masses could not have formed on the Earth The researches of Jean B. Biot in 1803 first convinced his colleagues that witnesses' accounts of the L'Aigle, France, fall were true and that the stones came from space.

In 1946, we have specimens of nearly 1,400 falls, about one fifth of which were actually seen to occur. (The one fifth is based upon data from the United States only) Most of these objects fortunately are in large museums the National Museum in Washington, D.C., the Field Museum in Chicago, Ill, and the British Mu-Seum have outstanding collections; and before World War II the Natural History Museum of Vienna had a noteworthy collection. There is a fine exhibit at the Vatican Museum, and also in other places, though not so large as those mentioned Small collections by private citizens should be discouraged, since too often, on the death of the owner, they are dispersed or lost.

Meteorites are roughly called either irons or stones, but the more accurate classification is as follows (1) irons or siderites, consisting mostly of nickeliferous iron; (2) stony-irons or siderolites, in which iron and stony matter are both mixed in large amounts; (3) stones or aerolites, consisting mostly of stony matter. There are two subdivisions of this last: (a) stones poor in 1700, generally without round chondrules, (b) chondrites, with some bronzite, olivine, and nickel-1700, and many rounded chondrules. It is obvious that while most meteorites fall clearly into one of the three main groups, there must be some borderline cases. Up to August 1943, the Society for Research on Meteorites listed 1,306 falls or finds classified as follows in Class 1, 491 cases, Class 2, 61 cases, Class 3, 814 cases. Among the elements which have been detected

Among the elements which have been detected in meteorites by either chemical or spectroscopic analysis, no new one has been found. This indicates that the same elements exist everywhere in space. Yet combinations of immerals are found which do not occur on our Earth. This latter is one of the proofs that these bodies were formed elsewhere and came to us fully developed. In 1945, consulting five different authorities, it was found that 55 of the 96 chemical elements have been detected in meteorites. It is interesting to note that of the elements with atonic numbers 1 to 33 inclusive, 30 have been detected; from numbers 34 to 56 inclusive, 14 elements have been found; but from numbers 57 to 96 only 11 are known.

Meteorites, even of the same class, differ considerably in their composition, hence individual analyses deviate much from the average. In general, however, speaking of stone meteorites in comparison to the Earth's crust, we find over five times the percentage of from but only about three fourths that of oxygen and silicon. The other well-known elements common to both are in quite different percentages We would, therefore, not expect to find in meteorites the same minerals or compounds which are familiar to us here on the Earth. The stones, in general, belong to a very basic class of rocks, low in silicic acid but high in iron and magnesium. Undoubtedly they have the characteristics of igneous, not sedimentary, rocks. The stones are very complex in structure and much fragmented Many show intrusions of other minerals which must have occurred after their original consolidation. The trons consist essentially of alloys of iron, nickel and cobalt, with which are commonly associated the phosplade schreibersite and the sulplade troulte. It is this type in which have been found small quantities of the rarer elements, including gold, indium, and platinum. In iron meteorites, which usually have from 7 to 15 per cent of nickel, a surface, polished and then treated with acid, shows characteristic patterns of intersecting bands, known as Widmanstatten figures. They are due to the inequality of the acid's action upon thick or thin plates of the various constituents, which are largely kamacite and taenite. The latter is richer in nickel than the former, and the bands narrower. The bands are indeed edges of plates arranged parallel to the faces of an octa-hedron, which is the form crystallization had taken Such meteorites must have formed under conditions of high temperature and great pressure for their internal structure to become what it is Indeed they must once have been in a liquid state and cooled slowly. Meteorites did not form in the presence of free oxygen. Reports of the finding of bacteria in meteorites are not thought to be correct; they were probably due to faulty laboratory technique.

Important Meteorites.—The largest meteorite discovered, if we omit the highly controversial Adrar or Chinguetti mass, is that still

lying near Grootfontein, Southwest Africa, called the Hoba West meteorite, the present weight of which is estimated at 60 metric tons ¹ Allowing for the iron shale around the meteorite would add 20 tons to the present weight. It is uncertain just when this was discovered (1920?), but in any case it had been lying there certainly for centimes. The next largest meteorite is the Ahmghito, or The Tent, brought from Greenland by Admiral Robert E. Peary in 1897, weight 331 tons. This, with two others from the same region but much smaller, and the Willamette from Oregon, weight 112 tons, are all nons and are in the Hayden Planetarium, New York City Mexthe Hayden Fanctarium, New Fork City Mexico possesses four very large from Bacubino, 21½ tons, Chupaderos I, 144 tons, Morito, 101 tons; and Chupaderos II, 68 tons. The other very large from is Mbosi, 12 tons, in Tanganyika Territory, Africa Incidentally the largest specimen found at Meteor Crater, Arrzona, is about half a ton None of the above objects was seen to fall, at least, no record survives

Turning to stone meteorites, we find a different result. This is in part because nons will last for thousands of veats, it large, and still be recognizable, while stones will decay. The largest single stony mass fell Feb 17, 1930, at Paragould, Ark. Its weight is 338 kilograms (745 pounds). Three other pieces from this fall weighed 73 kilograms more. The next, Knyations. Control by the result of the proposal 203 Library. hnya, Czechoslovakia, weighed 293 kilogiams Two very large ones 1 ong Island, Kans, total weight of fragments 504 kilogiams, and Bjurbole, Finland, 330 kilograms, were broken into fragments either in the atmosphere or on impact. All these were seen to fall. As for numbers of fragments, the fall at Pultusk, Poland, Jan 30, 1868, seems to break all records. About 100,000 tranments were picked up, the largest 9 kilograms, the smallest perhaps 1 gram. Of these, about 200 kilogram weight has been preserved. The Estherville, Iowa, fall of May 10, 1879, also furnished thousands of fragments, total 338 kilograms. At Holbrook, Auz, July 19, 1912, some 15,000 stones fell, total 219 kilograms. At present, many more talls are composed of stony than of iron meteorites, the proportion being about 9 to 1. Also most of those irons seen to fall have consisted of a single mass: the stony falls may be from one to many thousand. That we have so many nons in our collection is because, as pointed out in the case of large masses, irons survive weathering longer and also are more likely to attract attention

In modern times, meteorites have struck houses and fallen very close to people, but we have no authentic accounts—except that in Joshua—of people being killed, though there have been near escapes. Taking the United States, for example, the distribution of meteorites is most surprising. For instance, up to 1941, 28 had been found in North Carolina, and only 2 in Illinois—a more populous state of about the same area and with no mountains. The southern Appalachian region seems much favored, as are Texas, New Mexico, and Arizona; but the three very populous states, Massachusetts, New York, and Pennsylvania, had only 0, 7, and 6 respectively Colorado had 39 and Kansas 50, but this is due largely to the work of Harvey 14 Nininger, the most successful finder of meteorites, who has

¹ The metric ton will be used in this article. It equals 2,205 pounds or 1,000 kdograms.

explored mostly in that territory. Were equally thorough surveys made in other states, considerable numbers might be discovered, but no good explanation has been given for the curious distribution so far shown. Obviously, regions of small rainfall are those most favorable for meteorite survival and eventual discovery. It is clear that but few of the fallen masses are in any case recovered. The Earth is about three fourths covered by water; all meteorites that fall on the water areas are lost. Besides, there are vast regions near the poles where no one lives; great areas of jungle and much other ununhabited country. Even when small masses fall in thickly settled areas, unless the exact place of fall is known and at once examined, the chances for finding the meteorite are poor. It would be a very liberal estimate to say that one out of every hundred is recovered

Meteor Craters.—By far the most important effects produced upon the Earth's surface by the fall of outside bodies are the so-called meteor ciaters. Already several have been discovered and doubtless there are many others not yet found They were probably caused by the impact of not one mass but of a rather compact group of meteorites, perhaps we could venture to say the nucleus of a small comet, at least in some cases. The first to attract attention, and still the largest known, is Meteor Crater in Arizona. Around this, thousands of meteorites, weighing in the aggregate 10 to 20 tons, have been picked up At first believed to be a peculiar effect of vulcanism, its true character was definitely proved by Daniel M. Barringer in 1909 to be due to impact. This crater is 4,000 feet in diameter and 570 feet deep, with a 11m that is from 130 to 160 feet above the surrounding plain. Its bottom is filled to an extra depth of 600 feet by pulverized rock. The otherwise horizontal strata which form its walls are arched in the southwest quadrant. Geophysical surveys also indicate there is magnetic material buried there Despite this, scientists are now divided into two schools of opinion. One, trusting to the surveys and borings, believes that large metallic masses survive, buried under the southwest quadrant, the other, basing its conclusions on computations of what would happen when a mass great enough to make the crater struck, believes it was vaporized on contact. The writer is in the first group, being more inclined to trust to actual observations than theory, especially as men have never witnessed such a catastrophe at close range, or, if so, lived to report what really took place.

The next group of craters, 13 in number, is at Henbury, Australia, the largest being 660 by 360 feet; the smallest, only 30 feet. Iron meteorites have actually been excavated from some of

the smaller craters of this group.

The Odessa Crater in Texas is 530 feet in diameter and has a depth of 18 feet with a very low rim. Numerous small meteorite fragments

have been found around that.

Besides these we know of seven other craters, which only three are single. The most famous of which only three are single. The most famous of the seven are the Siherian Craters, formed on June 30, 1908; all the rest are prehistoric They were caused by a group of meteorites (very small comet?) which crossed central Siberia from south to north, finally falling at a spot in position longitude 101° 57′ E, latitude 60° 55′ N It was not until 1927 that an expedition under L. A. Kulık found the place, and therefore it was long

after the event before observers were interviewed and data collected. There were numerous small craters, and around the area the forests had been scared and flattened, the trees lying with their tops away from the center, over an area of from 30- to 50-kilometer radius. The spot is most inaccessible, the ground frozen in winter, swampy in summer. So far no meteorites are known to have been recovered. The principal damage had been done by the blast of superheated air, coming from that carried along by the solid fragments, where air and fragments struck the ground Fortunately the fall occurred in an uninhabited area Had it struck a great city, the latter would have been destroyed in an instant.

Origin.—There seems no sound reason to believe that meteorites differ from ordinary meteors except that they are larger. So whatever can be said as to the origin of the one would be equally valid as to the other. Hence the article METEORS should be consulted, to save repetition However, in meteorites certain additional points are clear which, at best, could only be inferred for meteors which can neither be analyzed in the laboratory nor have their mineralogical structure studied. When a meteorite is examined under a microscope, the structure always proves that it is the result of complicated actions. There seem but two possible types of hypotheses as to their formation they come from small masses of gases which somehow condense out in space, or they are debris of larger bodies which have been destroyed or disintegrated. While certain eminent men have leaned to the former theory, no one has been able to show how such a small mass could "get together" from gaseous molecules or atoms, nor, if they so got together, how the extremely complex meteoric structure could evolve Unless both these points can be explained, it would seem that we are driven to the second method of formation. Here we are at liberty to think of an exploded planet, asteroid, or possibly star and disintegrated nuclei of comets. There star, and disintegrated nuclei of comets. There seem no grounds for believing that meteorites ever could have been fragments of our Earth, perhaps ejected by prehistoric volcanoes.

To determine the age of meteorites would aid in settling their origin. Helium and lead are products of radioactive elements. As the rate of radioactive decay is known, for instance the total amount of helium accumulated in any period, divided by the actual rate of production of helium in the meteorite, gives the age of the latter. The method is more applicable to irons than stones, it being assumed gases can escape more readily from the latter and not at all from the former, once solidification of the minerals has taken place. Work by Fritz Paneth, William D Urry and W. Koeck on 23 irons indicated their age as being from 10⁸ years for the "youngest" to 2.8 × 10⁹ years for the "oldest." If these ages are correct, none seems appreciably older than we must assume the Farth to be Measure. than we must assume the Earth to be. Measurements on the Pultusk stones gave 5 × 10^s years, but this estimate is without doubt much too low, as the stones are at least semiporous. In comment, the results depend upon the assumption there has been no leakage. In millions of years, meteorites moving in what is a practically perfect vacuum, and heated on each approach to our Sun (or any other star), may lose some of their gas. If so, their ages would be greater than in-

dicated above. Some at least have such low velocities that we know they belong to the solar system and originated therein. Some of their orbits resemble those of short period comets. For others, observations (which are always rather uncertain as to duration) give hyperbolic orbits. If these orbits are truly hyperbolic, then these meteorites came from other parts of space. They could not have evolved in the solar system. Even so, this only tells where not how they came into being The two hypotheses on their origin that now are available have been mentioned. As with meteors, accurate velocities will settle fully whether they were permanent members of our solar system or not Further than that there is as yet no certainty.

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METEORITIC HYPOTHESIS, the theory of cosmogony propounded by Sir Norman Lockyer, to the effect that all astronomical systems, including the nebulae themselves, and in particular those consisting of a central body and satellites result, not from the condensation of a nebula, but from the interferences and collisions of meteors more or less fortutously grouped in space and with more or less fortunous velocities. The theory has long since been discarded. It is only of historical interest.

METEOROLOGICAL SOCIETY, The Royal, a scientific body with headquarters in London. Its organization dates from 1850, and in 1866 it was incorporated. All theories and facts pertaining to meteorology are sought for in its records, the development of that science in all departments being the object of the association Besides fellows, the society consists of honorary members, this membership being bestowed upon distinguished persons of other than English nationality. The society publishes the Meteorological Record and the Quarterly Journal. The Scottish Meteorological Society was incorporated with the Royal Meteorological Society in 1921.

METEOROLOGY, mē-te-ŏr-ŏl'ō-jĭ, science of the atmosphere. It began with the observations of primitive peoples whose outdoor occupations of hunting, tending flocks, and cultivating the soil depended greatly on the weather. Some of their speculations have come to us as weather proverbs. The Book of Job has many, but it is believed that some were old even then. That old weather rule which taught that the weather of each of the first 12 days of the year indicated the weather for each of the 12 following months was traced by Hellmann back to the 15th century B.C.

The term, meteorology, came from the Greek meteorologia which to the early Greeks meant the science of things suprateirestrial, and included, in addition to weather phenomena, spec-

ulations regarding many other matters
Aristotle (384-322 B.C.) wrote a treatise on meteorology which was standard for 2,000 years,

or until the beginning of the 17th century. He seemed to have influenced the philosophers of continental Europe more than those of England where they were more inclined toward experimental science.

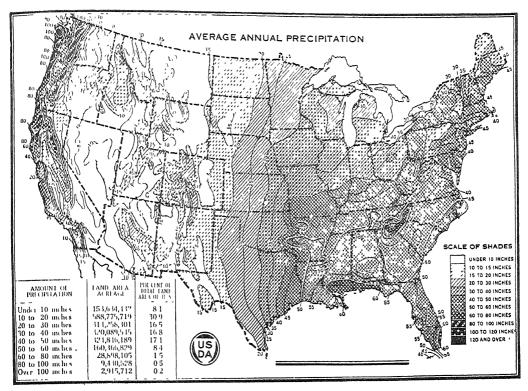
However, as early as the 12th century, under the influence of Roger Bacon in England and Pietre de Maricourt of France, speculative plulosophy was giving way to experimental science. The period of exact weather observa-tions began in 1500 with the invention of the thermometer by Galifeo and Sanctorus of Padua. Later, in 1013, Torricelli, a student of Galifeo, invented the barometer, then called «Torricelli's tube» Weather observations were then begun in Italy, and from there spread over all Europe.

It was necessary to have observations over a wide area before logical explanations of the weather could be attempted, although Benjamin Franklin wisely guessed that storms moved eastward, though he maintained observations at only two points. About 1820 Brandes, in Europe, discovered the rotation of winds around cyclones, and William Redfield, in the United States, the rotation and progression of hurricanes; this was done before the days of telegraphing, when observations were collected with great difficulty by mail In 1830, James P. Espy announced the very important principle of an cooling as it rose and expanded, and in 1811 published his Philosophy of Storms' in which he stated the importance of the expansion of using air in the formation of thunder torms and clouds.

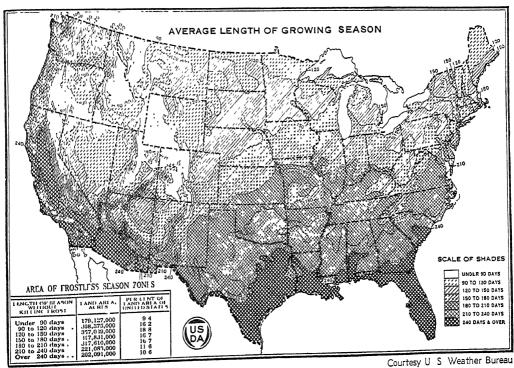
About 1850 began the establishment of meteorological organizations by the various governments of the world. In America the United States Weather Bureau was established in 1870 (see Weather Bureau), devoted at first to the task of giving notice on the northern lakes and on the seacoast of the approach and force of storms.

Source of the Atmosphere.—The surface of the earth is surrounded by a gaseous envelope. called the atmosphere. Many million years ago when the earth was pulled away from the sun, all the elements now composing the atmosphere came along with it, but very probably not in the same proportions as they now exist. The atmosphere was brought to its present extent and composition by changes in the original and by additions resulting from chemical changes in the earth, which are even now going on, as evidenced by active volcanoes and geysers. It is probable that at first carbon doxide and water vapor formed the larger part of the atmosphere. Oxygen was derived in part by being freed from carbon dioxide by the action of plants and by chemical decomposition of the rocks. Water vapor must have formed a large proportion of the atmosphere in the beginning and much of it condensed to form oceans and rivers.

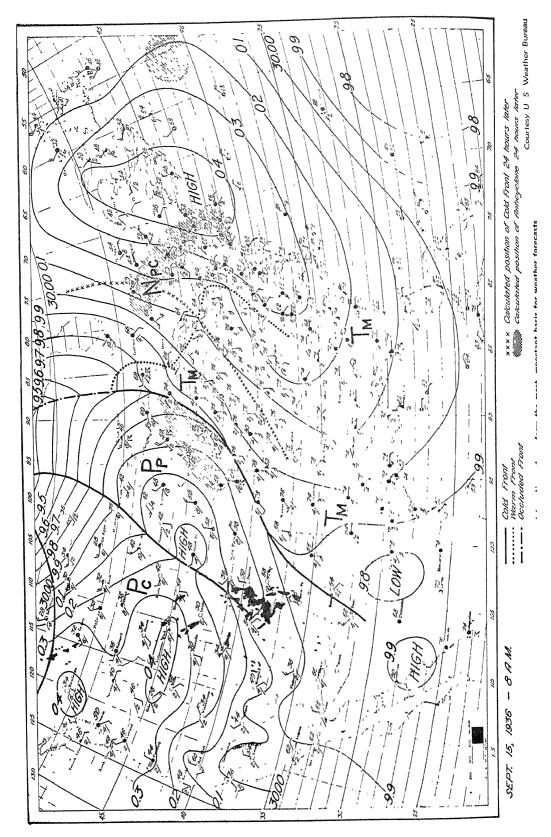
Extent of the Atmosphere.—As any layer of air is compressed by overlying layers, it follows that the one at the studace is densest. Air accordingly becomes lighter and lighter with increasing elevation until such great heights are reached that the force of gravitation can no longer hold the air particles and they fly off into space; this elevation is about 21,000 miles by calculation, too far away to be observed. However, the height of the appreciable atmosphere has been observed and measured by various means. As twilight is caused by the



A precipitation chart prepared from daily observations at thousands of American weather stations.



Data for this chart was obtained by carefully noting the times of last killing frost in spring and first in autumn at thousands of weather stations throughout the country.



reflection of sunlight from illuminated air particles when the sun is below the horizon, calculation shows that the atmosphere must extend to at least 37 nules. As meteors impinge upon the atmosphere, they become meandescent from friction, so that the atmosphere must extend as far as meteors can be seen; this gives a height of about 200 nules. Observations of the auriora borealis (q v), caused by electric discharges through rare air, indicate the height as anywhere between 400 and 600 miles.

Although no change in the proportion of the gases that compose the atmosphere has been observed, still, according to the laws of diffusion, above the region of convection, that is, in the stratosphere and above, the gases should be distributed according to their molecular weights, the lighter gases being more abundant than the

heavier

The mass of the atmosphere is enormous, being equal to 1/125,000 of the mass of the earth, and as calculated by W. J. Humphreys, weighing as much as a block of granite 1,000 miles long, 1,000 miles wide, and ½ mile high. The mass of oxygen is about 23 per cent and water vapor ½ of 1 per cent of that mass of cranife.

But in spite of the great height of the atmosphere and because the pressures drop off so fast with elevation, the middle layer is only 35 miles above the surface. If the atmosphere had the same density throughout as at the surface, it would form a layer only five miles

high

Composition of the Air.—The early Greek philosophers seemed to have regarded the air as a single gas, but the writings of Aristotle specifically say that clouds and rain are caused by the condensation of water vapor. So, for over 22 centuries, water vapor was the only gas

thought to be mixed with air.

By pure, dry air is meant air cleaned of its dust particles and having no water vapor mixed with it. Air is not a chemical compound but a mixture of 10 different gases of which nitrogen forms 78 and oxygen 21 per cent. Many analyses disclose no appreciable variations in the proportions except water vapor which varies from a trace to as much as 5 per cent at some places on hot, humid days. According to Humphreys, if all the water vapor were condensed out of the atmosphere, it would cover the entire earth with water about one inch deep. The density of water vapor decreases with altitude more rapidly than does that of air, and at a height where air pressure is one-half that at the surface, that of water vapor is only 17 per cent of its surface density.

After Aristotle, nothing further regarding the elements comprising atmospheric air was learned until 1752 when Joseph Black discovered not oxygen or nitrogen, which exist in such large proportions, but carbon dioxide whose volume is only three-hundredths of 1 per cent of the whole atmosphere. Nitrogen was discovered in 1772, and oxygen the following year; and with these important ingredients, nitrogen, oxygen, water vapor and carbon dioxide discovered, the problem was thought solved But in 1894 argon was found, and before the end of the century hydrogen, neon, helium, krypton,

and xenon were added to the list

While it is well known that oxygen is essential to life, ozone, a form of oxygen, is

equally so, but the fact is not so generally known Its function is to partially absorb the ultraviolet radiations from the sun which in small quantities are necessary to health, but if allowed to come through full strength would be injurious to animal tissues, especially the

Dust.—The atmosphere carries two loads: one of water and ice particles that make up the clouds, fog, and some of the haze; and another load of solid particles, generally called dust, but which is so prevalent and important that a word was coined to specify it, the staubosphere, meaning dust-sphere. Dust gets into the atmosphere in various ways, the evaporation of salt spray leaves some dry salt which is carried aloft; combustion, volcanoes, surface dust, the burning of meteors, and microorganisms supply vast quantities. Volcanoes, by the violence of their explosions, often shoot dust into the stratosphere, the results of which may be detected for years, on several occasions it was so thick as not only to obscure the sun but to modify the temperature. In a large city about 1,000 tons of dust are denosited each year per square mile.

deposited each year per square mile
Physical Qualities of the Atmosphere.— Weight of the Air-It is not entirely evident in the quiet of a room that air has weight or can exert any pressure John Tyndall in one of his lectures demonstrated that the air has weight by first balancing a copper container against a weight With the aid of a pump, he then forced air into the container, and when he again placed it on the scales, it sank; he then released the compressed air, when exact balance was again attained between the container and the weight. This showed conclusively that air has weight. A cubic foot weighs about 12 ounces; or the air in a room 10 by 10 by 10 feet would weigh about 75 pounds. As air has weight, the whole atmosphere presses down upon the surface. The average force is about 14.7 rounds not appear to the contract. 147 pounds per square inch at sea level That the atmosphere actually has weight was instrumentally demonstrated by Torricelli (1643) who invented the barometer. Pascal immediately reasoned that as the atmosphere had weight, or pressure, this weight must decrease with elevation, which he proved by making measurements with barometers both at the base and at the summit of a mountain, taking such suitable pre-cautions as would be done today to demonstrate his hypothesis

Specific heat of Air—Different substances (whether solids, liquids, or gases) have different capacities for heat; that is, it takes more or less of heat to raise one pound of one substance than another For instance, the specific heat of water is 1; that is, it takes 1 calorie of heat to raise 1 gram of water one degree centigrade, but it takes only 0 031 calories to raise one gram of lead one degree Air also has a low specific heat, taking only about one-fifth as much as water in the liquid state. The specific heat of water vapor is 0.3072, or about 10 times that

Diffusion—The early belief was that the atmosphere was homogenous It is, of course, not so in regard to pressure and temperature, but it is nearly so regarding the distribution of the individual gaseous constitutents. This distribution is perfect up to the stratosphere because the mixing is accomplished by the incessant winds and vertical currents. If there

were no air currents and the atmosphere were perfectly quescent, John Dalton states that each gas would arrange itself as though no other gases were present, the lighter gases, therefore, would be more abundant at high elevations, and the heavier gases more abundant at sea level. As water vapor gets into the atmosphere principally by evaporation, so it must diffuse upward, and if it were not for the winds, the

process would be very slow

Solar Radiation - Although the exact nature of solar radiation is not known, its effects have been very carefully investigated. The sun rays are polychromatic, that is, composed of various colors or wave lengths. The rays when put through a glass prism become spread, fan-shape, into the various colors from red to violet. This is called the visible spectrum. But beyond the red is found energy manifested as heat, and beyond the violet, the ultraviolet rays having photographic or chemical power. There is, however, no sharp line between heat waves, light waves, or chemical waves. The heat, or radiant energy, from the sun, earth, sky, and atmosphere have all been measured, for all substances raceive and about the heat and substances receive and absorb this heat, and are continually radiating it if their temperatures are above absolute zero. At one time it was thought that the radiant energy received by the earth at the top of its atmosphere was constant, but measurements by the Smithsonian Institution indicate that there is some variation. The amount of heat received by the earth from the sun is enormous. On an average day in midsummer at Twin Falls, Idaho, there is received per square mile solar energy equal to 38 million horsepower hours, and at Washington, D. C, 30 million horsepower hours. The amount received depends upon the dutage of the surface received depends upon the distance of the sun, transparency of the atmosphere, amount of slant, and the amount initially emitted by the sun. It has been calculated that the solar energy received by the earth in one minute is equal to the burning of 100 million tons of soft coal per minute.

A peculiar quality of heat waves is that when absorbed, they are changed when reradiated. Thus the sunlight after passing through the glass of a greenhouse and absorbed, can not pass outward through the glass. This

is known as the greenhouse effect

Heat Balance of the Atmosphere—It is clear that the earth with its atmosphere must lose heat at the same rate as received, or else it would get progressively colder or hotter. There is, therefore, a nice balance of the heat received by radiation from the sun and that lost by the earth and air Most of the incoming radiation is absorbed in the tropical region, almost 35 per cent at the equator, and about 12 per cent in the polar. But since much of the heat received at the equatorial region is transferred to higher latitudes, the outgoing radiation, or that lost, is about the same from all parts of the earth.

Heating the Atmosphere.—As pure, dry air is very transparent to the incoming radiation, most of the radiant energy passes through it without heating it and is absorbed at the earth's surface which in turn warms the atmosphere. This warming is brought about in two ways, radiation and conduction. The earth re-radiates some of its heat energy by longer waves than those received, which long waves are more readily absorbed by the atmosphere, particularly by the water vapor, carbon dioxide and ozone;

it also warms the air immediately in contact by the process of conduction. The air itself is a very poor conductor of heat, hence, heat cannot pass by that process from one portion of the atmosphere to another, but it is transferred most effectively from one part to another by the process of convection. The layer of air next the earth is heated by conduction being in contact with the warm surface, and also by long waved radiation from the earth. This heated an, being lighter than adjacent bodies of air, is forced to use by viitue of its huoyancy—the same principle as when a cork submerged in water also uses. The waimed air, after it rises, flows off overhead in lateral directions and in this way heat is transported from the lower to higher latitudes, the heat of the tropics and the cold at high latitudes are moderated by this process

Humidity This is the state of the atmosphere respecting water vapor. For most purposes of daily life, the relative limitidity of the atmosphere is what is used to express this condition, and is defined as the percentage of

saturation

Condensation Water vapor condenses when the dewpoint is reached or the relative humidity is 100 per cent, forming dew, frost, fog, or clouds. Cooling the an brings about saturation, which cooling is caused by radiation, contact with cold hodies, mixing with colder air, and principally by expansion. The most effective is the latter, also called adiabatic cooling, caused by air being forced up a slope or by rising due to its instability (warm air under or alongside colder air).

Forms of Precipitation—Condensation occurs on hygroscopic nuclei of on the ordinary dust of the air. When it occurs on high, it is called cloud; when near the surface, tog. The forms of precipitation from clouds are rain, snow, hail and sleet, of which there are many forms. Snow presents many beautiful pictures among which are the microscopic crystals. (See plate under Snow, Vol. 25.) An aggregation of snow

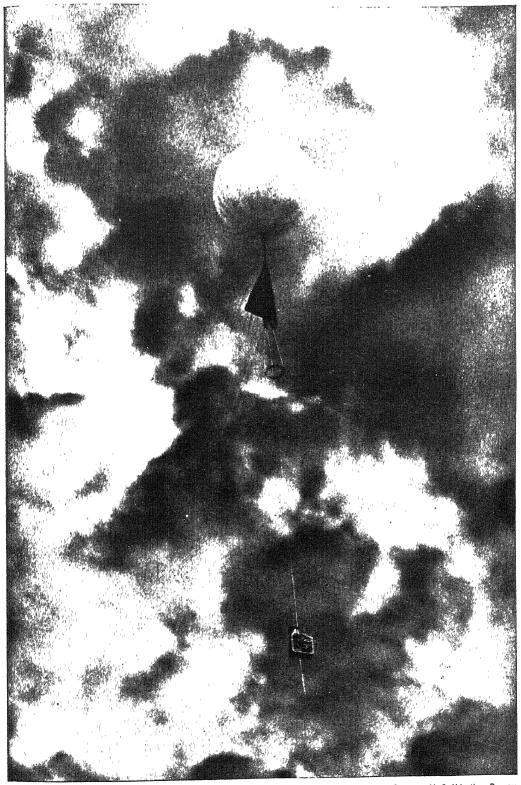
crystals forms the snowllake.

Distribution of Temperature.—The Lower Air The distribution of an temperature near the surface has been known for some time. As the sun shines with greatest intensity at the equatorial regions and least at the poles, it naturally follows that the former are warmest and the latter coldest. There are, however, important exceptions brought about by the very uneven distribution of land and water, and to a lesser extent, by ocean currents and winds.

lesser extent, by ocean currents and winds.

Isothermal Lines. These lines are drawn on a map through points of equal temperature. The isothermal chart for the year indicates that the "heat equator" (or highest isothermal) does not follow the geographical equator, but averages for the year about 10 latitude degrees north of it. As summer in the northern hemisphere approaches, this isotherm moves north, and in winter, south. But in this latter season only portions of it go south of the geographical equator and then only in South America, Africa, and Austraha. This is due to the effect of land and water. Land absorbs nearly all the radiant energy received very readily and heats quickly due to its low specific heat, while water reflects about 40 per cent, the remaining being transmitted to considerable depths. The surface of water due to these facts and also to its high

METEOROLOGY



Courtesy U S Weather Bureau

Free balloon carrying instruments for automatically transmitting upper-air data to surface by radio. Note parachute for easing instruments to ground

MEIEURULUGI



Releasing a balloon for upper-air observations



Courtesy U. 5. Weather Bureau

Launching radiosondes to determine weather conditions at all heights reached by the balloon. The instrument descends by parachute when the carrier balloon bursts.

specific heat (greatest of all common sub-

stances), heats up very slowly.

Another factor which keeps the oceans and all water surfaces cool is evaporation. As water evaporates, some of the heat in the water is used in effecting the change of state, that is, from water to water vapor. Ocean water is also m motion, not only the surface, but to a considerable depth. Thus the surface heating of the ocean is distributed, whereas the heat absorbed by land surface is retained where absorbed.

Because of these differences between land and water surfaces, great differences in temperature are found. Continents, especially the interiors, become very hot in summer and cold in winter. Oceans are characterized by moderate summers and winters, as are all land surfaces coming under their influence such as islands and the western shores of continents. These influences are telt even at poles: the North Polar region being the warmer as it is water-covered; and the South Polar region colder as it is composed mostly of land, much of it

elevated also.

Upper Air Temperatures.—The temperatures of the «free atmosphere» before the beginning of the century were not well known. It was known that temperatures decreased with elevation. That was learned from a few observations taken by acronauts in balloons and by kites bearing registering instruments. Temperatures on mountains were generally lower than those in valleys, but these were not «free atmosphere» temperatures as they were effected by the

mountain itself.

In 1898 L. Teisserenc de Bort made a series of soundings by sending up thermometers attached to line balloons, and made a discovery that was entirely unsuspected Everyone knew that the temperature of the air decreased with elevation, but thought that the decrease would continue until absolute zero was reached. But Teisseiene de Bort's obseivations showed that at a certain height the temperature (about 71 F. below zero) seemed to remain the same with further elevation and did not decrease as anticipated At first it was thought that his instruments were at fault. Others, however, made similar observations, and arrived at the same conclusion, that the temperature diminished up to a certain height and remained constant, up to a certain neight and temained constant, and even got somewhat warmer with further elevation. The term «isothermal region» was at first applied to this layer, but now it is known as the *stratosphere*. Captains Albert Stevens and O. A. Anderson in their famous stratosphere flight in 1935 reached 72,395 feet which is about twice as high as the beginning of the stratosphere where the flight was made of the stratosphere where the flight was made At their highest point, 96/100 of the atmosphere was below them, and the lowest temperature, 81° I'. below zero, was registered at the 68,000foot level when coming down.

Observers in many parts of the world made observations similar to those of de Bort's, with similar results; that is, temperature decreased up to a certain point and then remained stationary. When all these observations were pieced together, a very interesting distribution

was found as is exhibited in Fig. 1.

The heavy line is the tropopause above which is the stratosphere and below the troposphere. Note how the tropopause, the base of the

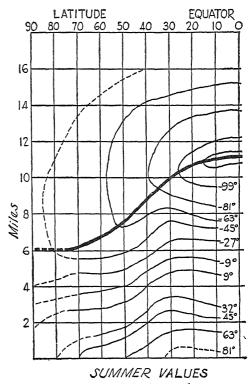
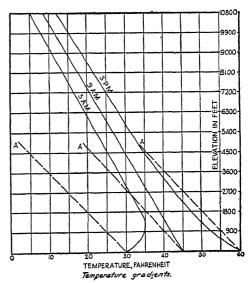


Fig 1. Summer vertical distribution of temperature.

stratosphere or surface where stationary temperature begins, is highest over the equator, and lowest over the poles. The temperatures in the stratosphere, as was not expected, are lowest over the equator and highest over the poles. The tropopause is higher in summer than in winter.



Curves A are adiabats, and solid lines are Fig. 2. vertical temperature gradients.

Temperature Lapse Rate—The rate at which temperatures decrease with elevation is called the vertical temperature gradient, or temperature lapse rate. The 9 AM line on Fig. 2 indicates graphically the average lapse rate. It is 1° F per 300 feet. But it should not be interred that the actual gradients are like the curve, they often show wide divergencies from the average lapse rate. In the early morning, for instance, the curve may have the form marked 5 AM. It is seen that the lower part of the curve swings away to the left indicating the cooling of the surface and lower layer of an during the night. As the sun comes out and warms the surface, the foot of the curve swings to the right, and about in the middle of the morning assumes the shape marked 9 AM. In the afternoon, due to surface heating, the surface part of the curve swings farther to the right, indicated by the 3 P.M. condition.

Adiabatic Process—Hot surface air, because it has expanded, is often forced to rise. In rising it further expands, and we have the phenomena of adiabatic cooling. This refers to the cooling of a mass of ascending air without the gain or loss of heat from or to an outside of the rising particle or mass. This assumption is often justified in the case of the atmosphere as the rising and falling of air masses is very rapid. In the case of dry air the rate of cooling is 16° F for 300 feet (see curves 11, Fig. 2 showing this rate), that is, a rising particle of air starting to rise at a temperature of 45°, will, after rising 1,500 feet, have a temperature of 37° F, a fall of 8°. This is known as adiabatic cooling. The reverse is also true. The same particle of air falling through 1,500 feet will, upon reaching the surface, have a temperature of 45° F. Thus, it is seen, in the case of dry air the process is reversible. The process is also reversible if during the rise the dewpoint is reached and condensation takes place, provided none of the condensed products, cloud, rain or snow, falls out but is retained by the rising mass of air.

Condensation of water vapor forming clouds is brought about principally by air rising in the free atmosphere or by being forced up

a slove.

Pseudo-Adiabatic Process.—The adiabatic process is not the ordinary procedure in nature as condensation often occurs and its products, rain, hail, or snow, will fall out, or at least a part of them. The rate of cooling is less in the pseudo-adiabatic process as the heat of condensation is added to the atmosphere which slows down the rate.

If an element of air rises with a temperature above freezing, it goes through four stages, called the *dry*, ran, had, and snow stages.

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Dry stage: As the element of air rises, it cools at practically the dry-adiabatic rate, that is, 1.6° F for every 300 feet until saturation is reached.

Rain stage: After saturation is reached, the element continuing to rise cools at the saturation-adiabatic rate until freezing is attained.

Hail stage. Upon reaching the freezing point

Hail stage. Upon reaching the freezing point and still saturated, the air continues to rise but remains at 32° until all water is reduced to rec, the cooling due to decreased pressure being balanced by the heat of fusion given out by the water.

Snow stage: After all the water has been

frozen, the air being still saturated, rises and cools, and condensation takes place as in the rain stage, but now the water vapor goes directly into ice crystals. This part of the process continues until the air is dry, after which it cools at the dry adiabatic rate.

It it is assumed in any of these stages that the products of condensation of any form whatsoever are carried along with the air, the process may be reversed, and the air would arrive at the starting point with the same temperature and water vapor content as it had in

the beginning

Stability of Air.— Since strong upward currents of air are very important characteristics of thunderstorms, studies of air conditions, whether stable or unstable, are necessary in understanding and forecasting these local storms. If the vertical distribution of temperature is such that a parcel of air resists displacement, the air is stable. But it the vertical distribution is such that a parcel of air because of its lesser or greater density than the surrounding air will rise or sink of its own accord, once given an impulse, the air is unstable

Stable An In Fig. 3 the rate of cooling of rising an is indicated by the line marked

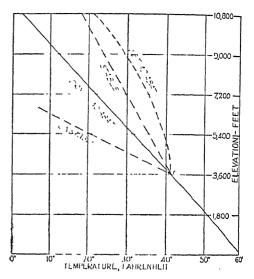


Fig. 3. Indicating stable and instable lapse rates, Solid line is dry adiabatic curve

dry adiabat; that is, if a parcel of air is forced to rise it will cool at the rate shown by this line, or 1.6° for every 300 feet. Now, suppose the vertical temperature gradient at the time is represented by the curve marked stable. If a parcel of dry air at Z is forced to rise, it will cool at the adiabatic rate; and when it attains the 5,400-foot level, its temperature will be 32°. But at that level the surrounding air is 30°. Since the parcel of air is colder than its surroundings, it will sink back to its starting point, and the air is stable.

Unstable Air.—Assume the vertical temperature gradient is that marked unstable. Again let a parcel of air at Z rise, it will cool at the adiabatic rate, and when it attains 5,400 feet, its temperature will be 32°. But at that

level its surrounding air is 20°. Since the parcel of air is warmer than its surroundings, it will continue to rise, and is unstable

when the to rise, and is unstable

If a parcel of air is saturated, it will cool
when rising as indicated by the wet adiabat.

As saturated air rises, some of its moisture is
condensed and the heat of fusion is added to
the air which keeps it warmer than the dry
adiabat. As it continues to rise, it continues
to lose moisture until finally when perfectly
dry, its rate will be the same as indicated by
the dry adiabat.

Wind and Pressure.—The primary cause of wind is difference in temperature between two places. An area of land or water surface becomes waitiner than adjacent areas, and the air above is waitined and expands; the rising air above flows away laterally, and the pressure is less. As air naturally flows from places of high to places of low pressure, a circulation is set up.

General Circulation.—As the heat received in the equatorial belt is greater than that radiated, and as the heat received in the polar regions is less than that radiated, there must be a transfer of air and heat from the equator to the poles and from the poles to the equator. But the resulting circulation is not simple, due to the earth rotating and to the unequal distribution of land and water. The rotation of the earth has the effect of causing all winds to deflect to the right in the northern hemisphere, and to the left in the southern

The effect of land and sea is opposite to one another Land surfaces, due to their ability to absorb and radiate heat readily, become in summer an area of low pressure, and in winter of high pressure. Over the occans the pressures are lower than those over the continents in winter, and higher in summer. This condition creates a monsoon which is a seasonal wind occurring with greater or less intensity wherever large land areas adjoin large water areas. The monsoon is best developed in India, blowing inland in summer and oppositely in winter. On a smaller scale the diurnal sea and land breeze on the eastern seacoasts are produced by the same conditions.

Storms.—There are three types of cyclonic storms; that is, storms with a whirling wind system They are tropical cyclones, extratropical cyclones, and tornadoes. The thunderstorm is a local storm with no circular wind system The tropical cyclone, in the West Indies, is called a hurricane. It forms near the equator over the sea where there is plenty of heat and moisture. It averages about 600 miles in diameter, and its winds blow in an anticlockwise direction around its center, called the eye of the storm. The distribution of humidity, rain and temperature is symmetrical around the center; it travels west with the trade winds and then recuives to the northwest and either dissipates, or upon entering northern latitudes, assumes the characteristics of an extratropical cyclone.

Extratropical Cyclones.—These are the general storms of the middle latitudes they are distinguished from the tropical hurricanes in being much larger in area, less regular in formation, and in there being no symmetrical distribution of weather elements about their centers. This latter feature suggests that within the cyclone area there are several air masses

with different temperature and humidity values. It is believed that the interaction of these air masses is what causes the many weather phenomena of these storms

Tornadoes—This is the most violent storm known, consisting of a whirling mass of air of small diameter with an intense cyclonic lotation. It is accompanied by heavy rain, and usually by thunder, lightning, and hail. It is believed that the underlying cause is extreme instability of the air brought about by an overrunning of cold air. The wind speeds have never been accurately measured but from the effects produced must be hundreds of miles per hour. The most striking visual characteristic is the funnel-shaped cloud.

Thunderstorms—The one feature common to all thunderstorms is a vigorous convection or updraft. This may occur when the surface air is unstable, when air is forced up a slope, or in cyclones when a cold mass overruns a warm mass. The strong vertical speeds produce large cumulus clouds which afterwards becomes the typical anvil-shaped thundercloud. The vertical speeds sometimes reach 200 miles per hour and more, which split the falling raindrops forming electrical charges on clouds, hence severe lightning discharges. It is said that pilots of airplanes have risen several thousand feet in a thunderstorm with the plane in a diving position, which vividly illustrates the speed of the upward currents.

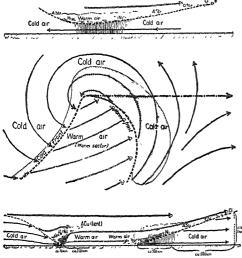
Air Masses.—An air mass is defined as a body of air homogenous as to temperature and humidity in its horizontal layers. If a body of air lies over a particular region, as northern Canada or a tropical sea, it will acquire properties of temperature and humidity peculiar to the region. Thus a mass of air over a northern continent will be cold and dry, and over a tropical ocean will be warm and moist. If an air mass moves from its source region, its identity is established by certain properties which change but little or very slowly, these are temperature and humidity. But the temperature used is not the current air temperature but the equivalent-potential temperature, which is that temperature resulting from taking a parcel of air to the top of the atmosphere, condensing out its water content, and then bringing it back to standard pressure. Also specific humidity is used, this is the mass of water vapor in a unit mass of moist air.

Air masses when identified are marked with suitable symbols on the weather map. The accompanying weather map of 15 Sept. 1936 has several air masses marked, as T_m for tropical maritime, and Pc for polar continental. The air masses recognized in America are polar continental, polar maritime, tropical continental, and tropical maritime, and their modifications. As air masses move from their source regions, they change slowly as they assume characteristics peculiar to the region over which they pass, or they may be modified by mechanical effects, as sinking or lifting.

Fronts.—The meeting of a warm mass of air with a cold mass is called a front A cold front is the discontinuity at the forward edge of an advancing cold air mass which is displacing warmer air in its path by underrunning the latter. A warm front is the discontinuity at the forward edge of an advancing current of relatively warm air which

is displacing a retreating mass of cold air, in which case the warm air overruns the cold mass

The Cyclone Model.—The Norwegian method of studying weather maps by an analysis of air masses, fronts, and their interactions is used in this country. The conception of a extratropical cyclone in an idealized form is shown in Fig. 4. The central portion of the



Courtesy U.S. Weather Bureau Fig. 4. Cyclone Model

cut is a plan of a cyclone; the curved arrows indicate the wind system, and the dash-dot arrow the direction of storm movement. The upper portion shows an east-west, vertical section through the cyclone a little north of the straight arrow; the lower portion of cut, a section through the cyclone south of this arrow. The shaded portions represent rain and clouds

Note that the surface air is cold in northern part and warm in southern. The cold air from the west is underrunning the warm air, lifting it up, causing condensation and rain. The warm southwest winds are overrunning the cold air to the east becoming cool, and rain is falling from clouds through the cold air to earth: if the cold mass has temperatures low enough, the rain would freeze and fall as sleet.

Forecasting.—The forecasters of the old school worked at first almost entirely empirically, and those of the new school, while they are greatly aided by the newer developments of the science and by the far greater mass of observations, principally of the upper air, also forecast to a great extent empirically. A forecaster with theoretical knowledge and long experience will predict more accurately than one with equal theoretical knowledge and no experience. The formulation of a good forecast depends upon a thorough analysis of not only the present weather conditions as shown on the maps but also upon a familiarity with those on maps for the past 24 or 36 hours previous. This analysis consists of a thorough study of the cyclones, anticyclones, air masses, cold and warm fronts; and the forecaster must compute the changes in positions of these elements. Before he formulates a forecast, he must visualize what the map picture will be like

12 or 24 hours hence—what changes will take place, thermal and mechanical, and the result of these changes. It is hoped that as atmospheric phenomena are better understood, forecasting will be a purely scientific job.

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METEOROLOGY, Marine, differs from that of land areas chiefly from the fact that the rays of the sun penetrate more deeply into the ocean substance than into the land and that the diffusion of this heat through the water body is practically uniform. The ocean thus becomes a vast storage reservoir of heat which is but slowly returned to the atmosphere. The effect upon the ocean chimate is to render it more equable. For instance, when the frost line on the land areas has reached as far south as the parallel of 38" N., on the ocean areas it is still at 65". N. See CLIMATE; OCFANOGRAPHY; Weather Burfau.

METEORS. See SHOOTING STARS.

METER, a mechanical device or instrument for automatically measuring, indicating, and recording the quantity measured.

cording the quantity measured.

Gas Meter. This is an automatic instrument which measures the volume of gas flowing through a pipeline. There are two types.

(1) the west meter, in which a drum submerged in liquid is rotated by the entering gas; indicators geared to the axis of the drum indicate the amount of gas flowing through the instrument; (2) the dry meter, in which the gas entering the instrument displaces a piston, the extent of the displacement being shown on a dial.

Water Meter. This mechanical device measures and automatically records the quantity of water flowing through a pipe. There are three types: (1) positive, which measures the actual volume of water; (2) inferential, which measures the velocity of the flowing water; and (3) proportional, which measures a fractional part of the full flow. See Current Meter; Water Meter.

Electric Meters.—These instruments are designed to measure either electrical current or energy, or its potential, resistance, inductance, or capacitance. There are three general types of electric meters: (1) the electrolytic meter; (2) the elock meter; and (3) the motor meter. The latter is most generally used. For other types of meters see under Appronautics; Americantees Electrical Measuring Instruments; Electrical Terms; Electrical Galvanometer

METH. See MEAD.

METHANE, Cll., also known in the impure state as Marsh Gas, or Firedamp, is found n large quantities in the gases evolved from petroleum wells, oil springs and mud volcanoes. It is present in stagnant pools (hence the name narsh gas) and in certain localities where organic matter is allowed to decay in a limited supply of air. The firedamp of coal mines is methane mixed with a small percentage of carbon dioxide, nitrogen and oxygen Enormous quantities of methane are present in the burning gases that constitute the "Holy Fire" at Baku in the neighborhood of the Caspian Sea Methane is formed in the fermentation of compounds like cellulose, milk sugar or calcium butyrate, in the thermal decomposition of alcohol, ethane, ethylene or acetylene and in the dry distillation of vegetable matter. Illuminating gas, produced by the destructive distillation of coal, may contain as much as 40 per cent of methane by volume

The compound may be prepared in a fairly

The compound may be prepared in a fairly pure state, (1) by treating commercial aluminum carbide with water, (2) by the interaction of hydrogen and an oxide of carbon at 250° C, in the presence of finely-divided catalyzers like cobalt, nickel or mon; (3) by heating a mixture of tused sodium acetate and dry soda-lime; (4) by the interaction of carbon bisulphide, metallic copper and hydrogen sulphide at an elevated temperature; (5) by maintaining charcoal from sugar in a stream of pure, dry hydrogen at 1150° C. Chemically pure methane has been prepared by the reduction of methyl iodide. In this process the iodine is mixed with equal volume of alcohol and treated with the «zinc-cop-

per» couple

Methane is a colorless inodorous gas with a density = 0.559 (air = 1). It burns with a famtly luminous flame and with the evolution of much heat. Mixed with air or oxygen in certain proportions and then ignited it explodes violently, one volume of methane forming with 9.5 volumes of air an extremely explosive mixture. On account of its low boiling point methane was for a long time known as one of the permanent gases. It was liquefied by Cailletet in 1877. The liquid is colorless, boils at —164° C. and solidifies at —185.5° C. when the pres-

sure is diminished to 80 millimeters. Methane is a saturated compound and is extremely stable. Reagents like fuming nitric acid, strong sulphunic acid or phosphoric anhydide have practically no action upon it even at elevated temperatures. In the presence of chlorine, bromine or fluorine, methane undergoes a chemical change by substitution, i.e., by the replacement of one or more hydrogen atoms by equivalent atoms of the halogen. Long contact with chlorine, for example, even in diffused daylight and at ordinary temperatures, will convert methane into CH3Cl (methyl chloride), CFI₂CI₂ (methylene chloride), CHCI₃ (chloroform) and CCI₄ (carbon tetrachloride), a molecule of hydrochloric acid being evolved with the introduction of each atom of halogen. At temperatures not lower than 1.300° C. methane has been completely decomposed into carbon and hydrogen. With a mixture of nitrogen and hydrogen in the electric arc it has been successfully converted into hydrocyanic acid Patents have also been taken for the oxidation of methane (under the catalytic action of tan bark) into formic acid,

methyl alcohol and formaldehyde. See Gases in Mines and Coal.

V. S Babasinian, Professor of Chemistry, Lehigh University.

METHODIST BOOK CONCERN. See METHODIST CHURCHES OF THE WORLD; METHODIST PUBLISHING HOUSE

METHODIST CHURCHES OF THE WORLD. Methodism began as a movement within the Church of England rather than as an organization The 18th century was an age of laxness and formalism in religious observances. The world was ready for a religious revival.

John Wesley (1703-91) and his younger brother Charles (1707-88), the founders of Methodism, were both ministers in the Church of England Their father, Samuel Wesley, was for many years rector of the Church at Epworth in Lincolnshire, 14 miles from the little town of Scrooby from which the Pilgrim Fathers started for America, a century earlier. This may have stimulated John Wesley's interest in the New World for the year 1737 found him in Georgia as a missionary to the Indians. It was not a very successful venture but was not without value, for his contacts on shipboard and in America with the Moravians taught Wesley that there was more to religion than withdrawal from society or the acceptance of a creed Upon his return to England (1738) he preached in two London churches, but instead of talking about his experience in America, he emphasized the need for a new life or "a new birth." The conservative churchmen did not wish any such emotional change in their people and forbade Wesley to preach again in their churches Wesley turned to his Moravian friends for spiritual guidance Peter Bohler, a young German, took a special interest in him, leading him to put less trust in religious forms and customs and more faith in religious experience.

The great change in Wesley's life came one night in an Anglican chapel in Aldersgate Street. The leader was reading Luther's 'Preface to the Epistle to the Romans' when Wesley tells us, "While he (Luther) was describing the change which God works in the heart through faith in Christ, I felt my heart strangely warmed. I felt I did trust in Christ, Christ alone, for salvation; and an assurance was given me that he had taken away my sins, even mine, and saved me from the law of sin and death." The historian William E. H. Lecky says, "It is scarcely an exaggeration to say that the scene which took place in that humble meeting in Aldersgate Street forms an epoch in English history." It was 24 May 1738 Immediately John went to his brother Charles and told him of his experience. Three days earlier a similar sense of satisfaction had come to Charles, who was destined to become the great hymn-writer of the Methodist Church.

A year after his conversion, John Wesley began to organize his followers into societies. Although the pulpits of the Church of England were denied to him, he kept his societies closely associated with the church After long indecision he determined by lot to go to Bristol and Greach in the fields, following the example of George Whitefield, one of the most powerful preachers of his generation, who preached to great crowds in both England and America.

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Methane is a colorless inodorous gas with a density = 0.550 (air = 1). It burns with a faintly luminous flame and with the evolution of much heat. Mixed with air or oxygen in certain proportions and then ignited it explodes violently, one volume of methane forming with 9.5 volumes of air an extremely explosive mixture. On account of its low boiling point methane was for a long time known as one of the permanent gases. It was liquefied by Cailletet m 1877 The liquid is colorless, boils at -164° C and solidifies at -185.5° C. when the pres-

sure is dumnished to 80 millimeters

Methane is a saturated compound and is extremely stable. Reagents like fuming mitric acid, strong sulphuric acid or phosphoric anhydide have practically no action upon it even at elevated temperatures. In the presence of chlorine, bromine or fluorine, methane undergoes a chemical change by substitution, ie, by the replacement of one or more hydrogen atoms by equivalent atoms of the halogen Long contact with chlorine, for example, even in diffused daylight and at ordinary temperatures, will convert methane into CH₃Cl (methyl chlorida) ide), CH₂Cl₂ (methylene chloride), CHCl₃ (chloroform) and CCl₄ (carbon tetrachloride), a molecule of hydrochloric acid being evolved with the introduction of each atom of halogen. At temperatures not lower than 1.300° C. methane has been completely decomposed into carbon and hydrogen. With a mixture of nitrogen and hydrogen in the electric arc it has been successfully converted into hydrocyanic acid. Patents have also been taken for the oxidation of methane (under the catalytic action of tan bark) into formic acid,

methyl alcohol and formaldehyde. See Gases IN MINES AND COAL.

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METHODIST BOOK CONCERN. See METHODIST CHURCHES OF THE WORLD; METH-ODIST PUBLISHING HOUSE

METHODIST CHURCHES OF THE WORLD. Methodism began as a movement within the Church of England rather than as an organization. The 18th century was an age of laxness and formalism in religious observances.

The world was ready for a religious revival John Wesley (1703-91) and his younger brother Chailes (1707-88), the founders of Methodism, were both ministers in the Church of England Their father, Samuel Wesley, was for many years rector of the Church at Epworth in Lincolnshire, 14 miles from the little town of Scrooby from which the Pilgrim Fathers started for America, a century earlier. This may have stimulated John Wesley's interest in the New World for the year 1737 found him in Georgia as a missionary to the Indians. It was not a very successful venture but was not without value, for his contacts on shipboard and in America with the Moravians taught Wesley that there was more to religion than withdrawal from society or the acceptance of a creed. Upon his return to England (1738) he preached in two London churches, but instead of talking about his experience in America, he emphasized the need for a new life or «a new birth » The conservative churchmen did not wish any such emotional change in their people and forbade Wesley to preach again in their churches Wesley turned to his Moravian friends for spiritual guidance Peter Bohler, a young German, took a special interest in him, leading him to put less trust in religious forms and customs and more faith in religious experience

The great change in Wesley's life came one night in an Anglican chapel in Aldersgate Street. The leader was reading Luther's 'Preface to the Epistle to the Romans' when Wesley tells us, «While he (Luther) was describing the change which God works in the heart through faith in Christ, I felt my heart strangely warmed. I felt I did trust in Christ, Christ alone, for salvation; and an assurance was given me that he had taken away my sins, even mine, and saved me from the law of sin and death.» The historian William E. H. Lecky says, «It is scarcely an exaggeration to say that the scene which took place in that humble meeting in Aldersgate Street forms an epoch in English history. It was 24 May 1738. Immediately John went to his brother Charles and told him of his experience. Three days earlier a similar sense of satisfaction had come to Charles, who was destined to become the great hymn-writer. was destined to become the great hymn-writer

of the Methodist Church.

A year after his conversion, John Wesley began to organize his followers into societies. Although the pulpits of the Church of England were denied to him, he kept his societies closely associated with the church. After long indeci-sion he determined by lot to go to Bristol and preach in the fields, following the example of George Whitefield, one of the most powerful preachers of his generation, who preached to great crowds in both England and America. Both men were very popular with the miners of England and it was not unusual for 20,000 to 30,000 people to assemble to hear them preach m the fields near Bristol. In spite of the opposi-tion of the churchmen of England and the popularity of the evangelical preaching, Wesley did not advise his followers to leave their churches and insisted that they go to the church for the sacraments

The name «Methodist» was applied to the Wesleys and their friends long before the establishment of the societies and the class meetings for prayer and fellowship. It was while Wesley was teaching as a fellow at Oxford and his brother Charles and Whiteheld were there as students that they began meeting together for spiritual enrichment. They planned ways of helping the needy, visiting the sick, holding services in filthy prisons. They prayed aloud three times a day and stopped every hom for silent prayer. Their fellow students looked upon them as cranks and dubbed them «Methodists» because of their methodical way of living. The same term was applied to the followers of Wesley He did not attempt to follow an established formula in setting up these societies, but met each situation as it arose. He was an incessant traveler, covering more than 4,500 miles a year on horseback until after he was 70 when he consented to use a carriage. He published numerous inexpensive tracts and sermons, as well as books on medicine. His emphasis upon the importance of the printed word led to the organization of the Methodist Book Concern (now the Methodist Publishing House, qv) soon after Methodism in America was successfully launched

The Methodist Revival was a singing revival, for these early preachers proclaimed a religion of joy brought about by a sense of release from sin Hymns could be remembered by the common people more easily than great preaching. Charles Wesley, through his hymns, brought a warmth to the Methodist movement which John, the logician, organizer, and great preacher could never have accomplished alone. Charles is credited with having written 6,500 hymns, most of which have been forgotten. The present Methodist Hymnal contains only 56

Early in his ministry Wesley discovered the power of the lay preacher Alter hearing Thomas Maxwell, a layman, preach, Wesley said, "It is of the Lord," and before he died these lay preachers became the foundation of Methodism Today, a large number of the preachers of English Methodism are laymen. A few ministers kept their pulpits open to the Methodists and accepted Wesley's appointments to supervise Methodist societies. Women also found a place as class leaders, sick visitors, and even as preachers. Wesley called his workers together annually for a conference, at which time they were assigned to new fields of service. This conference plan became a basic part of the organization of Methodism in both England and America. It was in the conference of 1769 at Leeds that Wesley presented the request from America for ministers Richard Boardman and Joseph Pilmoor volunteered.

METHODISM IN AMERICA

Nine years before the Leeds conference, Philip Embury, a young carpenter, came to New York, but it was not until 1765 that his cousin. Barbara Heck, persuaded him to preach to the people Captain Thomas, who describes himself as of the kine's service and also a soldier of the cross and a spiritual son of John Wesley,» was the colorful preacher in New York whenever he was able to be there. It was due to his influence that Boardman and Pilmoor were sent by Wesley to America

About the same time that Embury formed the Methodist Society in New York, Robert Strawbridge built a log chapel in Frederick County, Maryland The early records are not clear which one began preaching first in the

New World

The first numesters sent by Wesley landed in Philadelphia, and Pilmoor remained there while Bouldman went on to New York They ex-changed pulpits every three mouths. In 1771 Wesley sent Francis Asbury, a 25 year-old lay preacher to America commissioned as general superintendent of the work in the New World He was the son of a gardener and had been preaching since he was 17. Up and down the eastern scaboard he rode on horseback, preaching in kitchens, in the open, in barus and in churches, wherever he could get a few people to listen to the Gospel With the exception of a few years during the War of the Revolution when Thomas Rankin was superintendent, Asbury, served for the remainder of his life. He found 316 Methodists when he arrived. There were 214,235 when he died in 1816.

The war discouraged some of the preachers from England as every Methodist was looked upon as a Tory until he proved himself otherwise. Most of the Anglican immisters and most of the Methodists who held Anglican orders returned to England. Asbury sympathized with England but continued preaching in Virginia by keeping his sentiments to himself. The situation was desperate in America as there were wide areas with no ordained ministers to give commumon, baptize the children, or bless the vows of matrimony Several of the lay preachers wished to assume the full functions of the clergy but Asbury desired Wesley to send ministers from England or make some other provision for

America.

When the Anglican bishop refused to provide ordination for the American muisters, Wesley took matters in his own hands and ordained Thomas Coke as general superintendent with power to ordain others after he arrived in America. Much has been written about this action of Wesley. According to those who believed in the apostolic succession, Wesley had no right to ordain anyone. Methodists believe that this makes no difference and that ordination is from God, not from men. Richard Whatcoat and Thomas Vasey accompanied Coke to the United States and after consultation with Asbury a conference of the preachers was called

in Baltimore for Christmas, 1781

Methodist Episcopal Church.—At this General Conference of 1784 the Methodist Episcopal Church was organized. Although Wesley had chosen Asbury to be a superintendent along with Coke, Asbury did not believe he should be ordained until elected by the ministers. This was unanimously done and he was ordained a deacon, then an elder, and finally, a bishop of the Meth-

odist Episcopal Church

The conference adopted 25 articles of religion, adapted from the 39 of the Church of England These have never been changed.

Many of the features of English Methodism were continued munisters were moved annually; class leaders were placed in charge of groups of 12 or more, testimony and prayers were given a pronument place in these meetings, six months probation for members; a ministry of two orders, and circuits consisting of two or more churches, annual conterences for the itinerant ministers. The election of bishops, the district superintendent, and the quarterly conference for the local church seem to be characteristic of American Methodism | Faily Methodists were so satisfied with the episcopal form of government that it decided in 1808 that no future general conference could «change or alter any part or rule of our government so as to do away episcopacy or destroy the plan of our itinerant general superintendency."

As America spread westward following the Revolutionary War, the Methodist preachers went with the settlers. Some joined the wagon trains, while others joininged alone across the mountains. They stopped to preach in the cabins and in the clearings. Most of these men were not trained but, following the examples of Wesley and Asbury, they carried books and tracts in their saddlebags, reading as they traveled. Preaching stations were opened and grouped into circuits. Frequently the preacher would only get to each point on his circuit once in two or three months. It has been said that there were more Methodist preachers in Kentucky, Tennessee, Ohio, and Indiana than there

were doctors The preachers came together annually to discuss their work and receive assignments. When it became an impossibility for all of the men to come to a central place for an annual conference, the country was divided into several annual conferences. Ministers were frequently changed from one circuit to another. It did not take long to pack and move as most of the men were young and unmarried All of their personal effects could be carried on their horse. They were given from \$25 to \$100 a year and raiely received all that was promised. The lives of these early itinerants make fas-

cinating reading Freeborn Garrettson preached m Maryland, Virginia, the Carolinas, Delaware, New Jersey, Pennsylvania, Nova Scotia, and New England. He inherited slaves from his father but acting upon what he felt was divine guidance he set them all free Jesse Lee went throughout New England as an evangelist, and later served as Chaplam for the House of Representatives Thomas Ware, John Dickens, and many others of that early period lived lives worth writing about. Most of them died prematurely because they gave of their strength so generously. Nearly half of the first 700 ministers died before they were 30 years of age, and two-thirds died before they had served 12 years. Religion was worthy of living and of dyngr of dying.

In the early 19th century, Methodism was moving westward. Peter Cartwight was fear-lessly preaching in Tennessee, Kentucky, and Illinois. William McKendree, who organized the Western Conference (west of the Alleghenies) was elected bishop in 1808. He was one of the greatest preachers of Methodism. John Clark went to Texas in 1841. In 1844, Joseph Hurlburt began preaching in Minnesota The Methodists were in Dakota in 1860, and Jason Lee reached the Pacific Coast in Oregon in 1834 The first Methodist society was organized in San Francisco in 1847

The first foreign missionary sent out by the Methodist Church was Melville Cox, who went to Liberia in 1832. He was broken in health and only lived four months after his arrival in Africa Eleven others were appointed in three years. Three of these died, but the interest in missions had been aroused and spread rapidly. In 1836 the first two missionaries sailed for South America Methodism entered China in 1847, but it was not until 10 years later

that the first convert was baptized.

By 1850 American Methodism had established work in Liberia, Buenos Aires, Foochow, and Germany In 1856 William Butler sailed for India He realized he could not do the 10b alone and sent to America for assistance. James M Thoburn responded Mass evangelism was then a popular method and on one day toward the end of his work he baptized over 1,000 converts Methodist missions spread to other lands: Norway and Sweden, 1853-54, Bulgaria, 1857; Italy, 1872; Mexico, 1873, Burma, 1879, Malaysia and Korea, 1885, the Philippines, 1899 It has now spread to more than forty countries. Now there are more missionaries than there

were ministers at the time of Wesley's death As the church grew in numbers new annual

conferences were organized, a publishing house was established, Sunday schools flourished, and a widespread missionary program evolved On 5 April 1819, the Missionary and Bible Society of the Methodist Episcopal Church in

America was organized. It was approved by the General Conference in 1820 For 12 years it confined its work to the United States, ministering to the French in Louisiana, the Indians and the frontier whites in Oregon, Texas, California, and other western states

The church was governed by the General Conference which met every four years Lay delegates were admitted in 1872. (See also The

METHODIST CHURCH below.)

The Methodist Protestant Church.-The first schism in American Methodism came when William Hammett, an Englishman, led a group out of the church in 1791 because he did not believe American Methodism had the proper respect for Wesley He called his church «Primitive Methodists» but the organization disbanded after his death in 1803

The second break in the Methodist ranks came when James O'Kelly founded the Republican Methodist Church in 1792 because he felt the church was becoming too despotic A minister had no right of appeal after the bishop appointed him to a new charge. The new church was short-lived and many who left with O'Kelly returned to the Methodist Episcopal ministry, including William McKendree (later bishop). The principal losses were in Virginia and North Carolina

The desire for greater democracy came up again in the early 19th century with many of the preachers working to reduce the power of the episcopacy by favoring the election of presiding elders (district superintendents). Several of the ministers withdrew or were expelled during this controversy and organized the Methodist Protestant Church in 1830 with 83 ministers and about 5,000 members. For a while the church grew rapidly and at the time of the union of

the three largest bodies of Methodism in America in 1939 had nearly 200,000 members. Its greatest strength was in the East. During the Civil War the church was divided into two branches but reunited in 1877. (See also Tile

METHODIST CHURCH below)

Reformed Methodist Church.—This church came into existence because a group of laymen and local preachers in New England in 1814 were opposed to the episcopacy. In 1814 there were 3,000 members but only a few hundred

iemain

Wesleyan Methodist Church.—Wesley had called slavery «the sum of all villamies,» but, as the issue grew sharper between North and South, tension in general conferences grew. Abolitionist ministers had a hard time to get into some of the annual conferences. Others were suspended from the ministry for writing abolitionist tracts, because the bishops were anxious to preserve peace and unity in the church. When the General Conference of 1840 refused to hear a minority report against slavery, several ministers withdrew and in 1813 the Wesleyan Methodist Church was organized Secret societies were banned and it took a strong stand against slavery Within two years there were 15,000 members mostly in New York State In 1939 there were 22,000 members and about 650 churches. Its publishing house is in Syracuse, N Y.

Methodist Episcopal Church, South. During the quadrennum between the general conferences of 1840 and 1844 tension between North and South increased. Bishop James O Andrew had married a second time and through this marriage became a slave owner. Through his mother he had also inherited a Negro boy. Legally, under the Georgia law, he could not free these slaves. When the news reached the North that the bishop had inherited these slaves, those Methodists who were opposed to slavery insisted that the bishop be removed from office. A resolution was offered in the General Conference of 1844 asking for his removal. Most of the 11 days of debate centered around the right of the conference to remove a hishop from office for slaveholding. Stephen Olin, president of Wesleyan University, had taught in South Carolina and understood both sides of the situation and pointed out that the real issue demanded a separation into two sections and expressed a hope that it could be done in the spirit of love. The resolution requiring Bishop Andrew to «desist from the exercise of this office so long as this impediment remains was passed 1 June 1844. The Southern conferences immediately notified the General Conference that they could no longer remain under its control. A committee drafted a Plan of Separation which was adopted by the General Conference by a vote of 135 to 15. The division was not a secession but an agreement reached in the «spirit of peace, brotherly kindness and charity.» Ministers were permitted to choose in which church they would serve. The plan provided for the division of property, the assets of the Book Concern, etc., should the annual conferences agree to the plan of separation. The Southern conferences accepted the plan but the Northern groups rejected it. The Supreme Court of the United States decided in favor of the South. Meanwhile the Southern conferences had organized the Methodist Episcopal Church, South. In doctrine,

discipline, and government it differed very little from the Methodist Episcopal Church. (See also THE METHODIST CHURCH below).

THE MLIHODIST CHURCH

Within two months after the Civil War had ended, overtures were made looking toward umon of the Methodist churches, but it was not until April 1939 that the Uniting Conference was held in Kansas City, Mo. It brought together the three major Methodist bodies in the United States The Methodist Episcopal Church, The Methodist Episcopal Church, South, and the The united Methodist Protestant Church Methodism had a total of 7,918,373 members in 1939 There were 48,150 churches served by 21,930 ordained ministers and a number of supply pastors. The Church School had an enjolment of 5,978,533

The Articles of Religion adopted by The Methodist Church were those which had been historically held by the three churches. The General Conference, which meets quadrennially, has legislative power. The episcopal office was retained and the Methodest Protestant delegates elected two of their munisters to become effective bishops of the Methodist Church There is equal representation of clergymen and laymen m anmual, jurisdictional, and general conferences. A Indicial Council determines the legality of actions of the conferences and of decisions of the bishops. The church is divided into six jurisdictions as follows.

Northeastern: Mame, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island. New York, Pennsylvania, New Jersey, Maryland, West Virginia, Delaware, District of Columbia, and Puerto Rico.

Southeastern: Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee,

Kentucky, Mississippi, and Cuba

Central The Negro Annual Conferences, The Negro Mission Conferences and Missions within the U.S.A.

North Central: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, North Dakota, South Dakota,

South Central: Missouri, Arkansas, Louisiana, Nebraska, Kansas, Oklahoma, Texas, and

New Mexico.

11 estern Washington, Idaho, Oregon, California, Nevada, Utah, Arizona, Montana, ming, Colorado, Alaska, and Hawaiian Islands.

The jurisdictional conferences meet quadremially for the election of bishops for the jurisdiction and the promotion of the program of the church.

The first General Conference of the Methodist Church was held in April 1940 at Atlantic

City, N. J.

Bishop Asbury once said, "we have the poor but they have no money; and the worldly, wicked rich we do not choose to ask.» The annual budget of the church is now more than \$75,000,-000 with churches and parsonages valued at \$664,362,386.

The cornerstone of Cokesbury College, the first Methodist educational institution, was laid in 1785. There were in 1941, 139 institutions with an enrolment of 93,000 students and net resources of \$295,000,000. This includes such resources of \$295,000,000. This includes such well-known universities as Syracuse, Southern Methodist, Duke, Ohio Wesleyan, Northwestern, and University of Southern California.

The work of the church is carried on through the following boards and agencies set up by the General Conterence, and supported by the benevolent giving of the church through World Service offerings.

Board of Musions, New York City Created to "extend the evangelizing educational, healing. and other helpful munistries of the church to needy areas of life in every part of this country

and around the world »

The Division of Foreign Missions has 736 missionates and 2,477 nationals in service overmissionaries and 2,77 haronals in service overseas. The Methodist Church of Mexico (26,000 members), The Korean Methodist Church, (25,000 members), The Methodist Church of Brazil (25,000 members) are still affiliated with the hoard but are now autonomous. The Japan Methodist Church (44,000 members) is now united with the other Christian churches of Japan.

The Division of Home Missions supports 2.770 pastors and other workers in America and

its possessions

The Woman's Division of Christian Service

also has work in America and abroad

The Roard of Inducation, Nashville, Tenn.: «To provide encouragement, help and opportunties for persons to grow in their desire and their ability to live according to Christ's standard as enunciated in the great commandment of love»

The board operates through three divisions: the Division of the Local Church, the Division of Educational Institutions, and the Editorial

Division.

Theological Schools are partially supported by the World Service giving of the church. There are nine theological schools under the auspices of the Methodist Church: Boston Uniauspices of the Methodist Church: Boston University, Boston, Mass., Drew University, Madison, N J; Duke University, Durham, N. C.; Emory University, Atlanta, Ga (2); Garrett Biblical Institute, Evanston, III; Ihiff School of Theology, Denver, Colo; Southern Methodist University, Dallas, Texas; and Westminster Theological Semmary, Westminster, Md.

Bourd of Pensions, Chicago, III, supervises the service of the church to its 5,000 retired ministers and 7,000 ministers' widows and their

ministers and 7,000 ministers' widows and their

Board of Temperance, Washington, D. C .: Established «to promote . . . voluntary total abstinence from all intoxicants and narcotics; to promote observance and enforcement of constitutional provisions and statutory enactments which suppress the traffic in alcoholic liquors and in narcotic drugs; . . . to seek the supression of contents and in alcoholic liquors and in narcotic drugs; . . . to seek the supression of contents and alcoholic liquors and alcoholic liquors and alcoholic liquors. sion of salacious and corrupting literature and degrading amusements, lotteries, and other forms of gambling and in every wise to promote the public morals.» The Discipline.

The Commission on Courses of Study, Nashville, Tenn, surveys the needs of ministers and offers courses of study for the various classifications of ministers in the Methodist Church More than 2,000 ministers are annually enrolled in the course of study and in 1941 over 6,500 ministers attended summer schools sponsored by

this commission.

The General Commission on Evangelism, Nashville, Tenn., promotes schools of evange-lism, retreats for pastors, revivals, radio broadcasts, the establishment of new Sunday schools, and the reading of devotional literature. It publishes The Upper Room, a pamphlet of daily

devotions which has a circulation of more than a million copies quarterly

The Commission on World Peace, Chicago, encourages international justice and good will. It stresses the Christian principles which must be observed before there can be a just and lasting peace

Negro Methodists .- From the very beginning of Methodism in America the circuit riders met with Negro classes Harry Hosier, a Negro preacher, frequently accompanied Asbury on his travels From 1790 to 1810 one fifth of the membership was made up of Negroes.

In 1813 the African Union Methodist Episcopal Church was started in Delaware It now

numbers about 20,000.

The largest Negro group is the African Methodist Church which has a membership of approximately 650,000 It was started in 1816 when the members of Bethel Church, Philadel-

phia, united with other Negro groups

From old John Street Church, New York came another group of Negroes in 1796 They claimed they were not permitted to take communion until after the whites and would have greater freedom in a church of their own In 1801 they erected Zion Church and did not withdraw from the Methodist Episcopal Church until 1821 when they organized the African Methodist Episcopal Zion Church. It is now the second largest Negro Methodist group with nearly 600,-

000 members
The General Conference of the Methodist
Episcopal Church, South, worked out a plan for separate General Conference for Negroes in 1870. In December of that year this group became the Colored Methodist Episcopal Church

ın America.

There has been a fine cordial relationship between the two groups through the years This group has a membership of nearly 400,000 and

its own publishing house in Jackson, Tenn
The Methodist Episcopal Church in 1876 made provision for separate annual conferences for Negroes. Under the jurisdictional plan of the Methodist Church in operation since 1939, representatives from the Negro annual conferences meet together for a Central Jurisdiction Conference to elect their own bishops and representatives to the various boards and agencies of the church. There are 15 colleges and schools for Negroes, operated by the Methodist Church, with an enrolment of over 5,000 students

Methodism in Canada.—A separate annual conference for the Canadian Methodists was formed in 1824 following the War of 1812. In 1828 this conference became the Methodist Episcopal Church in Canada. It united with the British Wesleyan Methodist Conference in 1833 to form the Wesleyan Methodist Church in Canada. Since 1925 the Methodists have been a part of the United Church of Canada which had in 1941 a membership of 711,712.

Free Methodist Church.-Some of the preachers of the Genesee Conference held that there was a moral decline because the preachers were no longer preaching sanctification and the doctrine of Christian Perfection. In 1860 a number of ministers and laymen withdrew from the Methodist Episcopal Church and organized the Free Methodist Church at Pekin, N Y. In 1940 they had 45,890 members and 1,259 churches. Emphasis is placed upon plain, simple living and the doctrine of entire sanctification. Laymen have equal rights in annual conferences, membership in secret societies is forbidden as is

the use of tobacco

Primitive Methodist Church (in America).—This denomination migrated from England to the United States in 1829. It has two annual conferences and about 12,000 members The United States has a separate General Conference which in 1940 had 85 churches and 12,130 members.

Congregational Methodist Church.-- A the Methodist Episcopal withdrawal from the Methodist Episcopal Church, South, in Georgia, this church had in 1940 a membership of 16,508. It was organized in 1852 because of a desire for congregational

government

New Congregational Methodist Church. This church also broke off from the Methodist Church, South, in 1881 over the question of government, and a desire for a stationary ministry. It has only about 1,200 members.

British Methodism

At the time the Methodist Episcopal Church was being organized in America, Wesley was insistent that Methodism in England was not a church but a movement within the Church of England The fact remains, however, that many people belonged to Methodist societies who never would join the Anglican Church. It was not long, however, before Wesley ordained ministers for Ireland, Newtoundland, and Scotland In his later years he was even prevailed upon to ordain a few ministers for the societies in England Thus, at the time of his death in 1791 all legal arrangements had been made for the organization of the Wesleyan Methodist Church The administration of the sacraments were forbidden in 1792 but provision was made for ordination of ministers and administration of sacraments at the conference of 1793 Laymen were admitted to the conference in 1878. church claimed 520,000 members in Great Britain in 1926 and 471,312 foreign members. A strong missionary zeal has characterized Methodism ever since its origin

Primitive Methodist Church (in England).—Lorenzo Dow, a missionary to America, returned to England with tales of the great camp meetings and revivals. When Hugh Bourne and William Clowes insisted upon holding such meetings in England they were expelled from the church. Although they had no desire to organize a new church, many who also felt a desue for freedom, rallied around these leaders and the Primitive Methodist Church resulted. In 1926 there were 219,335 members. Hartley College, Manchester, is the training school of this group.

The United Methodist Church.—William O'Bryan was expelled from Wesleyan Methodism because of irregular attendance at class meeting. He had been preaching wherever he felt there was a need. His followers were called Bible Christians (1810). They united with the United Methodist Free Churches in 1907. The latter church had combined several small churches in 1857 (Protestant Methodists, Wes-leyan Methodist Association, Wesleyan Reformers, and others). In 1926 they reported 147,591 members.

The Wesleyan Reform Union.—This group of less than 10,000 members refused to enter the

umon in 1857.

Independent Methodist Churches.-About 10,500 members and 140 churches with a con-

gregational form of government

Australasian Methodist Church.-Beginning in 1816, several branches of British Methodism found a place in Australia but all were united in 1902 except the Primitive Methodists of New Zealand. There were 106,101 members m 1920.

The New Zealand Methodist Church.-A union of several Methodist groups with a mem-

bership of 28,731

Methodist New Connection. - See New

CONNECTION METHODISTS

Wesleyan Methodist Church.- This church was organized in Utica, N. Y., in 1843, while the church was discussing the slavery question. After the Civil War it emphasized the doctrine of sanctification. There are 730 churches with

a membership of 26,220 (1939).

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METHODIST PUBLISHING HOUSE, The. Established in 1789 in Philadelphia as The Methodist Book Concern, name changed in 1939, the Methodist Publishing House now has branch stores in 11 cities of the United States. It published in 1941 1,500,000 books and 130,000,000 copies of periodicals. Under the imprint of the Abingdon Cokesbury Press, 1,820 books are now in print. The Christian Edworate, the official publication of the church, has a circulation of nearly 275,000 copies. Twenty-five church school publications are published to meet the needs of various age groups. The assets of the publishing house amount to \$7,885,000. In 1941 there was a sales volume of nearly \$5,500,000. Headquarters, Nashville, Tenn.

METHODIST YOUTH FELLOWSHIP,

The. When the three Methodist bodies united in 1939, it was necessary to unify the youth work in the three churches. This union was completed in 1941 when the Methodist Youth Fellowship was launched. The name was chosen by a vote of the young people throughout the church. The details of organization were largely planned by youth groups, although the responsibilities for promoting the program lies with the Youth Department of the Board of Education of the Methodist Church. The Methodist Youth Fellowship includes all of the young people connected with the church school between the ages of 12 and 23 years, inclusive. This includes those attending the Sunday morning sessions of the church school, Sunday evening meetings such as Epworth League (qv), Christian Endeavor, and University of Life, or other youth groups within the church.

The national organization is known as the National Conference of the Methodist Youth Fellowship. Its membership is composed of presidents of annual conference youth organizations, the presidents of state or regional student organizations, representatives from the staff of the agencies working with youth in church, and selected young people designated by the

conference.

The Methodist Youth Fellowship is organized in each annual conterence of the Methodist Church and provision is made for district and subdistrict organization where desired. In the local church, the Methodist Youth Fellowship is divided into three departments: (1) intermediate (ages 12, 13, and 14); (2) senior (ages 15, 16, and 17); and (3) young people (ages 18 to 23). Intermediates do not participate in the program beyond the local church. Provision is made for two types of youth organization. Plan I provides for a unified plan with one set of officers serving for all functions within a given age range. Plan II provides for separate organization for morning and evening sessions or as many divisions as seem advisable for the local church.

The activities of the organization on each age level (conference, district, subdistrict, and local church) are carried on through four commissions: Commission on Worship and Evangelism; Commission on World Friendship; Commission on Community Service; and Commission on Recreation and Leisure The National Conference of the Methodist Youth Fellowship is responsible for specific projects in the youth field and has its own secretary who is a co-operating member of the Youth Department and the Department of Student Work in the Board of Education of the Methodist Church.

METHODIUS, mě-thō'dĭ-ŭs. See Cyrillus and Methodius.

METHOW RIVER, a river in the north central part of the State of Washington Rising in the Chelan National Forest, it flows southeasterly and meiges with the Columbia River just east of the town of Pateros. The Methow drains the larger part of the western half of Okanogan County The narrow valley to which the river gives its name has no large towns, and is given over principally to faims, orchards, and pasture lands. It is especially well known for its apple orchards which produce four excellent varieties of apple—Delicious, Winesap, Jonathan, and Rome Beauty. At one time the author, Owen Wister, lived in the Methow Valley, he drew upon this locality for several of the characters and episodes appearing in his novel, 'The Virginian's

METHUEN, mě-thū'ěn, Paul Sanford, Baron, English general. b Corsham Court, Wiltshire, 1 Sept 1845. He is descended from Sir Paul Methuen who effected the treaty, named after him, between England and Portugal in 1703. He studied at Eton, entered the Scots Guards in 1864, saw special service on the Gold Coast in 1873, received a medal for bravery in the Ashanti campaign in 1874; became attaché in Berlin (1877), assistant quartermaster-general Home District (1881) and quartermaster-general in Egyptian War (1882); won a C M G in Bechuanaland (1885), was in command of the Home District from 1892 to 1897, and commanded one of Buller's divisions in the unsuccessful attempt at the beginning of the South African War to relieve Kimberley. At Magersfontein he was terribly beaten. With Lord Roberts he marched on Pretoria in May 1901. In March 1902 he was captured between Vryburg and Lichtenburg, but immediately released. His ill success in South Africa was attributed to the difficult circumstances, and he was placed over the Eastern Command after the Boer War In 1907 he was commander-in-chief in South Africa, in 1909 governor of Natal, was created fieldmarshal in 1911, in 1915–19 governor of Malta and after 1920 governor of the Tower. Died 1932.

METHUEN, Mass., town in Essex County; alt. 105 feet; on the Spicket River, 28m NW. of Boston, on the Boston and Maine Railroad. Its industrial products are yarn, shoddy, worsted cloth, shoes, wooden heels, brooms and weaving equipment. The Nevins Memorial Hall and Library is a notable building First settlement of the site was made about 1642; it was included within the limits of Haverhill until 1725, when it was incorporated as a separate municipality. In 1917 it was chartered as a city, but in 1921 it returned to town government. It was named for Lord Paul Methuen, pre-Revolutionary official. Pop. (1940) 21,880.

METHUEN TREATY, a commercial treaty between Great Britain and Portugal, signed in 1703 and annulled in 1835, having to do with the tariff on wines and wool It was negotiated by Sir Paul Methuen, the British Ambassador to Portugal.

METHUSELAH, mě-thū'sě-la («a man with a dart?», Hebrew patriarch. The name appears in old manuscripts also as Mathusala and Mathusale It has been variously translated as "Man of God," "Man of the Javelin," "Man of Sclah" Because Sclah was a title of the god Sin, these other derivations are possible. He is remarkable as the oldest man mentioned in the Bible, his age being stated in Genesis v, 27 as 969 years. According to Hebrew chronology and to that of the Samaritan version (which, however, reduces his age to 720 years), he died in the year of the Flood; but the Septiagint calculation makes him die six years eather. Few will be found who believe that a man ever attained such an age. The most rational conclusion is that the original writer had in mind a period different from the year of 365 days. Consult Langdon, S, in 'Proceedings of Biblical Archæology' (London 1914).

METHYL ALCOHOL. See ALCOHOL and METHYL.

METHYL AND ITS DERIVATIVES, in chemistry, this name is given to the hypothetical radical CIL, assumed to exist in methylic alcohol and in very many other carbon compounds. Methyl forms the first of the series of alcohol radicals, the general formula of which is Cill₂n+₁, and gives use to an almost innumerable list of compounds. In the year 1848 Frankland and Kolbe, by the action of potassium on ethyl cyanide, obtained a gas the composition of which agreed with the formula C₂H₆; now such a body may be regarded either as (1) ethyl hydride C₂H₆H₁, or (2) as two atoms of methyl linked together to form one molecule.

CIIs CIIs

For a considerable time the new substance was supposed to be free methyl, that is —

CII₃

and to be isomeric, but not identical with ethyl hydride $C_2H_b.II$.

According to the generally received views concerning atomicity (see Chemistry) such a body as ClI₄ could not exist in the free state, it was therefore in keeping with chemical theory to believe that in the moment of its liberation the atoms of this substance should combine together in pairs to form the stable molecule—

CH₃

A few years later Frankland succeeded in preparing the same body by the action of zinc on ethyl iodide, $Z_n + 2CH_sI = Z_nI_s + 2CH_s$. Frankland compared the action of chlorine on this supposed $2CH_s$ with the action of the same gas on the so-called ethyl hydride ($C_sII_s.II$), and concluded that the two bodies were not identical. Schorlemmer has, however, studied this action of chlorine more carefully, and he finds that the resultant substances are the same in each case. The reactions which take place between equal volumes of chlorine and of the gas C_sH_s may be thus formulated:

(1) C₂H₆ + Cl₂ = C₂H₅Cl + HCl.
 (2) C₂H₅Cl + Cl₂ = C₂H₄Cl₂ + HCl.
 The first reaction is the principal one; small

quantities of the body CILCL (dichloro-ethane) are, however, always formed. The identity of the two substances formerly known as free methyl and ethyl hydride has been thus proved, so that we now know of only one body having the formula CH₆, to this substance the name of ethane is given, it forms the second hydrocarbon in the marsh gas, or CnII2n+, series. From these considerations it is evident that the radical methyl is known only in combination with other bodies. By the action of chlorine on certain methyl compounds the body CHaCL is obtained, from which again the bodies CH.Cl., CHCl. and CCh may be produced The oxide of methyl (CIL) O, or methylic ether, is produced by the action of sulphuric actd upon wood spirit, this ether may be taken as typical of a large series, in which one of the groups CH_a is replaced by another radical (either alcoholic or acid). The hydroxyl derivative of methyl, or methylic alcohol, CHOIL is prepared in many ways. The most generally employed method consists in rectifying the product obtained by the dry distillation of wood (hence its common name -- wood alcohol or wood naphtha), but in order to obtain perfeetly pure methyl alcohol it is necessary to prepare a methylic ether, generally methyl oxalic ether, decompose this by distillation with water, and dehydrate the alcohol so obtained by means of quicklime. Methylic alcohol is a colorless mobile liquid, having a specific gravity of 8142 at 32" F.; its boiling point lies about 140° F. It mixes with water in all proportions with the evolution of heat. It burns with a clear blue flame. It is a ready solvent for fats, resms, camphors and fatty oils. The presence of a certain amount of methylic alcohol in ordinary or ethylic alcohol does not interfere with the use of the latter substance in many chemical operations. Such a mixture is known in commerce under the name of methylated spirit, Methylic alcohol yields by oxidation formicacid (CH₂O₂), thus CH₄O + O₂ = CH₂O₂ + H₂O.

Another important series of methyl derivatives consists of substances known as methylumines; these are strongly basic and are generally regarded as ammonia in which one, two or three hydrogen atoms are replaced by one, two or three atoms of the radicle CH3, thus giving rise to two other groups - the dimethylamines and the trimethylamines. Thus know of the substances NH2.CH2, NH(CH₈)₂, and N(CH₈)₃. Further, as we know of such bodies as ammonium iodide and chloride, so we are acquainted with the corresponding methyl ammonium salts N(CH3)4I, etc. Methylene is a colorless gas with a strong odor resembling ammonia. It is highly inflammable, and burns with a yellow flame. The group CH₀ may also be introduced into many of the natural alkaloids (see Strychnine), giving rise to methyl derivatives of these bases. Another extensive series of derivatives are the methylenes, of large importance in the manufacture of dyestuffs.

METHYLATED SPIRIT, alcohol or spirit of wine containing 10 per cent of wood naphtha, which contains a large proportion of methylic alcohol (see Metriya). It is much used in the arts as a solvent, for preserving specimens, in the manufacture of varnishes and for burning in spirit and other lamps.

METHYLENE, Bichloride of, an organic compound of great value as an anæsthetic. It is a colorless fluid having an odor like that of chlorotoriu, and is pleasant to inhale

METHYLENE BLUE, an amline dye a bluish crystalline powder having a bronze-like lustre. It is used in medicine, and in malaria is given as a substitute for quinne. See Dyrs

METIS, me'(is, in ancient mythology, the first wife of Jupiter, whom he was said to have devoured, after which Minerva (qv.) was formed within his head

METLAHKATLA, met-la-ka'tla, or METLAHKATLAH, the native name of the oldest and most successful mission among the Indians of British Columbia, founded in 1857, by William Duncan, an English missionary, who developed a model community from a tribe of the lowest cannibals. A government school was opened there in 1913. Consult Arctander, K. J., 'Apostle of Alaska' (New York 1909)

METONIC CYCLE, a period of 19 solar years, after which the new and full moon fall on the same days of the year as they did 19 years before. This cycle was the discovery of Meton, a celebrated Athenian mathematician, 432 BC. The Metonic cycle contained 6,940 days, which exceeds the true length of 19 solar years by 9½ hours nearly. On the other hand, it exceeds the length of 235 lunations, or synodic revolutions of the moon, by 7½ hours only. In the ecclesiastical calendar the number of the year in the cycle is called the golden number (q.v.). The cycle is supposed to commence with the year in which the new moon falls on the 1st of January

MÉTRE, me'ter, the unit of length in France, 39.37079 English inches, roughly one yard 3 1/3 inches. The metre was intended to be the ten-millionth part of the quadrant of a meridian of the earth. The centimeter, the one-hundredth part of a metre or nearly 4/10ths of an inch, possesses more advantages in physics as a unit of length; it is also found very convenient for many purposes for which the English yard is employed. See Metric System; Weights and Measures

In music, the equalization of time in the division of a composition. The measure (q.v) is the smallest element in metre; two measures make a section, two sections make a phrase and two phrases make a period. See Music.

In poctry, that measure of verse that determines the rhythm. It is commonly divided into feet and lines; a series of feet is a colon See POETRY.

METRIC SYSTEM, The. In the latter half of the 17th century, the French astronomer, Jean Picard (1671), and the Dutch physicist, Christian Huyghens (1673), proposed as a standard unit of length that of a seconds pendulum at sea-level on the 45th degree of latitude This is only about six millimeters shorter than the meter now in use. Some years earlier, Sir Christopher Wren had advocated that a half-seconds' pendulum should be chosen as such a unit; this would have approximated one-half the length commonly given to the ancient cubit In 1670 the French mathematician, Abbé Gabriel Mouton, had suggested as a length unit

one minute of the earth's circumference, what is now in use as a geographical mile, and he had divided and subdivided this decimally, giving a good Latin terminology for the various di-visions and multiples However, more than a century was to clapse before, under the inspiring influence of the spirit of innovation born of the French Revolution and its precursor, the American War of Independence, a new scientific and logical system of weights and measures was created, one which has already replaced the old and illogical systems in a great part of the world and is probably destined to become, before many years shall have passed, the universal system In view of the opposition to any change in this direction still shown by many to-day in England and the United States, it is a strange coincidence that in the very year (1790) when the first steps leading to the establishment of the metric system were taken in France, a new system of weights and measures was offered by John Miller to the British House of Commons, and also by Thomas Jefferson, the Secretary of State, to the House of Representatives of the United States Jefferson's report formulated a decimal division of the various units A still closer approximation to the metric system was present in that proposed by the inventor, James Watt, who selected as the unit of mass a definite volume of water, and provided for a simple interrelation of the units of length, area, volume and mass; he communicated this to Talleyrand

As has been stated, it was in 1790 that the project for a new system of weights and measures was taken up by the French National As-In March of that year, Talleyrand published a proposition to this effect, which he and Prieur des Vernois submitted to the Assembly. That body after referring the project to the Committee on Agriculture for preliminary consideration took it up on 8 May 1790 and on 22 August, a decree, sanctioned by Louis XVI, provided for the establishment of a new system, invited other nations to participate in the project and entrusted to the Académie des Sciences the task of determining on the unit to be employed as a standard. Some representatives from Spain, Italy, Denmark, the Netherlands and Switzerland took part in the discussion of the plan The Académie des Sciences, in accord with the provisions of the decree, appointed a committee composed of the scientists Borda, Lagrange, Lavoisier, Tillet and Condorcet, and on 27 Oct 1790, this committee submitted its report to the Assembly To secure additional data, a second committee was appointed, in which Laplace and Monge were substituted for Lavoisier and Tillet This second committee, in its report of 19 March 1791, recommended the adoption of the one ten-millionth part of the curdonal of the lionth part of the quadrant of the terrestrial meridian as the standard unit of length The Assembly accepted this suggestion, and on 26 March 1791 appointed five commissions, each charged with some department of the arduous task It was decided to make, as an exact basis of calculation, a measurement of an arc of 10 degrees on the meridian of Paris The composition and attributions of the commissions were as follows:

1 Cassini, Méchain, Legendre; to measure the difference of latitude between Dunkirk and Barcelona, and to compute the triangles. 2 Monge and Meusnier; to compute the bases

3 Borda and Coulomb, for the observation of the pendulum

4 Lavoisier and Hauy; for researches as to the weight of distilled water

5 Tillet, Brisson and Vandermonde, for

comparison of ancient measures

On 1 Aug 1793, the Convention passed a decree, on the proposition of Arbogast, to the effect that the use of the new system should be declared obligatory at the end of the year. In this decree the nomenclature of the system was determined. Unavoidable delays in the measurement of the arc necessitated some successive modifications, and it was not until the 11th Ventôse, An III (1 March 1795) that an approximately definite report was sent in, to be followed by the decree of 18th Germinal, An III (7 April 1795), which finally established the different parts of the metric system. Lavoisier and Hauy were assisted by Le Fevre-Gircan and Fabbron in determining the exact weight of a definite volume of water.

The decree of 7 April ordered the continuation of the operations for the exact determination of the units, and to this end provided for 12 commissions to be named by the Committee of Public Instruction. The members chosen were Berthollet, Borda, Brisson, Coulomb, Delambre, Hauv, Lagrange, Laplace, Méchan, Monge, Prony and Vandermonde. On 10 July 1795, Borda and Brisson presented their report of the verification of the meter, but the measurement of the meridian arc, begun by Delambre and Méchan, 25 June 1792, could only be terminated in 1799. It is interesting to learn that, some years later, the work was continued in the Balearic Islands by Biot and Arago.

As a first step in the legislative enforcement of the system, a decree of 23 Sept. 1795 (1st Vendémiaire, An IV) had provided that its use should be obligatory in the commune of Paris, and in the 'Constitution de l'An IV (1795-96)' its principle was formally recognized On 16 Oct 1798 (25th Vendémaire, An VII), there assembled in Paris a body composed of the delegates of 10 independent nations, designated to establish finally the fundamental units. The report, made in the following year by Van Swinden, of the Batavian Republic, gave the conclusions arrived at, and determined the length of the meter as 443 296/1000 lines of the old "Toise de Pérou," the latter being approximately equivalent to 63944 English feet. This report was adopted by the Convention 22 June 1799 (4th Messidor, An VII), and the prototypes in platinum of the meter and kilogram were presented by the Institute. They were immediately deposited in the Palais des Archives of Paris, copies being placed in the Conservatoire des Arts et Métiers, and in the Observatory of Paris, while iron meters were consigned to several foreign countries, including the United States

It is well worthy of note, in view of the eventual absolute success of the metric system, that at first its progress was slow. For quite a time the people continued to cling to the old measures, and this led, under the First Empire to the promulgation of a ministerial edict, dated 28 March 1812, authorizing the employment of "transitory measures"; among which

were the use of a toise (fathom) of 2 meters (the actual length of the old torse was 1949 meters), of an aume (ell) of 120 meters, of a borseau (bushel) of 125 liters, etc. It was not until the monarchy of Louis Philippe that absolutely final and decisive action was taken in the matter. The Marquis de Laplace presented to the Chamber a report, upon which was based the law of 4 July 1837, according to the terms of which "all weights and measures except those established by the laws of 18th Germinal, An 111 and of 19th Frimaire, An VIII (7 April 1795 and 10 Dec. 1799)" should be prohibited after 1 Lan 1810. Belgium, Holand and Greece were the first countries to adopt the metric system, and before the end of the 19th century, it had become the standard with 40 nations, and had attained world-wide use in science.

Nearly a score of years before the passage of the French law just mentioned, the movement for the adoption of the system in the United States had already found able advocates, one of the most notable being John Quincy Adams, who in a report made to the Senate, on 22 Feb. 18.21, proposed that an international conference should be held to study the merits of the metric system and to provide for co-operation with France tending toward its universal adoption In the same year two metric standards, made of platinum, were sent to the United States by Albert Gallatin (1701-1819), then Minister to They were both authenticated by a France. certificate from the great physicist Arago, stating of the kilogram that it differed less than 1 milligram from the original "kilogramme des Archives". In form it is a cylinder with flat bases, the edges slightly rounded. Height and diameter are nearly equal, approximately 39.5 millimeters each. The only distinguishing mark is a faint lathe or tool mark of a point within a circle. The square mahogany box m which it was placed hore the following words empraved on a silver plate attached to the cover: "Kilogramme comparé pour son Poids a l'Éta-Ion Protype des Archives de France, et verifé par M Arago Fortin teen." Despite the as-sertion that its variation from the standard was but I milligram, it was found, when compared in 1879 with the British platinum kilogram, to be 4.25 milligrams light, and this find-ing was confirmed in 1884, when it was taken to the International Bureau of Weights and Measures at Sevres, and compared with two auxiliary kilograms, known to have the same values as the kilogram of the Archives. This final determination gave the error as -4.63 milligrams. The intrinsic worth of this platinum kilogram to day, with the metal quoted at \$105 per ounce Troy, would be \$3,375, while at the time it was made the value would hardly have exceeded \$300.

Older than the Arago kilogram is the "committee meter," as it has been called, which was given to Mr. F. R. Hassler, later superintendent of the Coast Survey, by J. F. Tralle, the deputy from the Helvetic Republic in the committee charged with providing for the production of the metric standards in 1709. It was brought by Mr. Hassler to the United States in 1805, and was a short time later donated by him to the Philosophical Society of Philadelphia. Not long afterward, when Mr. Hassler took

up the Coast Survey work, the society placed this standard at his disposal, and until 1890 it served as the standard for the determinations made by the survey. This meter is made of iron, and is marked with the stamp of the committee, which was a small ellipse, having three quadrants shaded, the remaining one bearing the figures 10,000,000, that of the number of meters in a quadrant of the earth's meridian

Almost a half century clapsed after the proposal of a metric conference by John Quincy Adams before this project was realized. On 1 Sept. 1869, a decree of Napoleon III summoned an international conference to provide for the production of new and absolutely exact metric standards of mass and length. Fifteen nations responded to this invitation, and the delegates assembled in Paris, 8 Aug. 1870. In spite of the tearful disasters of the French armies and the consequent rapid invasion of French territory by the Germans, five meetings were held before the conference was forced to disband. The following were the 15 countries accepting the invitation of the French government to send representatives to this first Paris conference, of August 1870. Austria, Ecuador, France, Great Britain, Greece, Italy, Norway, Peru, Portugal, Russia, Spam, Switzerland,

Turkey, United States, Colombia

The project was not abandoned, however, and a second conference was called two years later, under the Third Republic, and representatives of 30 nations assembled in Paris on 24 Sept 1872, remaining in session until 12 October of that year. Then deliberations resulted in the adoption of 40 resolutions bearing on the construction of the new standards, of these 21 especially applied to the meter and 12 to the kilogram, the remainder referring to various details of the plan to be pursued, and to the precautions to be taken for the preservation of the standards when produced, as well as for the maintenance of their invariability A most important point was the exact determination of the alloy to be employed, and the eventual decision was that it should be one of 90 per cent platitum and 10 per cent indium, a tolerance of 2 per cent in excess or deficiency being permitted. This alloy possessed at once a high degree of hardness and of resistance to chemical action, and also was susceptible of receiving an exceedingly fine finish. A main share in the task of ensuring the production of a thoroughly satisfactory amalgamation of the metals was entrusted to the chemist, Henri Sainte-Claire Deville The first ingot made had a weight of 238 kilograms and is commonly known as the "alloy of 1874," from the year in which it was produced This alloy, however, did not meet with the approval of the commission, although several standards were made out of it to test its qualities It was now determined to have recourse to the skill and experience of the great London firm of platinum refiners, Messrs. Johnson, Matthey and Company, and as a result of patient effort they were finally able to offer a casting which was found by the chemists of the International Commission, and by those of the French section, to exceed the requirments; from it were made 31 prototype meters and 40 kilogram weights. The meters were sent, early in 1887, to the International Bureau to be compared with the "mètre des Archives" and also with one another. By 1889

this task had been accomplished, and on 26 September of that year the work or the International Committee received the approval of a general conference assembled at Paris The meter and the kilogram found to be in closest agreement with the meter and kilogram of the Archives were denominated the "International Meter," and the "International Kilogram," and were deposited at the International Bureau of Weights and Measures, in a vault provided with three separate locks, the keys to which are in the possession, respectively, of the Custodian of the Archives of France, the president of the International Committee and the director of the International Bureau vault must not be opened oftener than once in a year, and in the presence of the three officers to whom the keys have been confided. To each of the contributing countries were given two of each of the new standards, which were all accompanied by attested certificates of comparison, two hard glass thermometers, each of which had a table of corrections in terms referring to the hydrogen scale, and a piece of the alloy cut from the end of the bar and destined to be used in testing the coefficient of expansion, cach kilogram had a rock-crystal bedplate and other requisites for its safe conveyance. The meters allotted to the United States, Nos 21 and 27, bore corrections of +25 microns and -16 microns, respectively; the probable error of the determinations being estimated, as a result of 784 individual comparisons, at less than 02 microns. The two kilograms assigned were numbered 4 and 20, and had corrections in weight of —0075 and 0039 milligrams, and in volume of 46418 and 46402 milliliters, respectively Here from 1,092 individual weighings the error of the determination is less than 0002 milligrams. Meter No 27 and Kilogram No. 20 were carefully packed and brought to this country under seal by George Davidson of the Coast and Geodetic Survey On 2 Jan. 1890, President Harrison received them at the Executive Mansion The seals were broken in his presence, and he gave a certificate to the effect that they had been received in good condition, and that he was fully persuaded they were the standards to which the report referred. The other kilogram and meter were received in July 1890, and were deposited in the Office of Weights and Measures where the meter and kilogram recognized by the President as national standards had already been placed. By a decision made by the superintendent of weights and measures, on 5 April 1893, and approved by the Secretary of the Treasury, the international meter and kilogram were made the fundamental attended of the secretary of the secretar mental standards of length and mass in the United States, this applying to the customary weights and measures as well as to those based on the metric units. The standards passed on the metric units. The standards passed under the control of the Bureau of Standards on its establishment 1 July 1901, pursuant to the provisions of the act of 3 March 1901

The International Prototype Meter is an irido-platinum bar, 102 centimeters in length. Three lines are engraved near each end of the bar; they are from six to eight microns wide, and about one-half millimeter apart, and the meter is defined as the distance between the middle line of each group, when the temperature of the bar is at 0° C. The lines used to define

the meter and its subdivisions were traced at the Conservatoire des Aits et Méticis in Paiis

While the preliminary work for the production of the new standards was in progress, in March 1875, another international conference was called by the French government, in which France, the United States and 15 other nations out of the 19 represented signed a convention on 20 May 1875, providing for the establishment and support of a permanent International Bureau of Weights and Measures, the management and control of which should be in the hands of an international committee having 14 members, each from a different country. As a site for this bureau, the French government of the street of the ment assigned a piece of ground at Sèvres, in the Park of Saint Cloud, declaring it to be neutral territory. It was agreed that the expenses of the bureau were to be borne by contributions paid by the contracting governments, the amount being proportionate both to the population of the country and the extent to which the metric system was used there

The routine work of the bureau is performed under the supervision of a body termed the International Committee of Weights and Measures This is in turn subject to the control of a general conference to which all the contracting governments send delegates, and which is to meet at least once every six reals. This conference is charged with all questions regarding the measures to be taken to spread the use of the metric system in the countries which have not yet adopted it, and it is also called upon to pass definitely upon any new fundamental determinations that may be proposed.

The Advantages of the Metric System and its Proposed Adoption by the United States and Great Britain.—The initial difficulty and expense incident to a substitution of the metric system for that now in use in the United States and Great Britain have been much exaggerated by many writers on the subject. There would be no necessity for absolutely replacing the machinery appliances now in use; all that would be needed in the great majority of cases would be to re-mark them in accordance with the metric scale, and to adjust their operations in accord with metric requirements. It has indeed been truly said that the only machines that would altogether lose their usefulness would be those for making the old measures. It need never be necessary to change the present lathes, drills, shapers, etc., since there would be no necessity for the manufactured objects to have a particular metric size; all that would be needed would be to have them marked and listed in the metric designations of their actual size. It should be borne in mind, in this connection, that at present the sizes of parts are seldom exact unit sizes, since they are not made to conform to an arithmetical rule but to the exigencies of their practical mechanical use.

The metric system finds an earnest advocate in Hon. William C Redfield, Secretary of the Department of Commerce. In an address at the Fifth Annual Meeting of the Chambers of Commerce of the United States, in Washington, on 2 Feb 1917, he said of our present system of weights and measures that it "stands as a bar across that path to foreign trade which it is necessary that we should tread." In another

address, made before the Philadelphia Chamber of Commerce, 10 Jan. 1917, he noted that it required four pages of an official publication to describe the various kinds of bushels that exist in America, and that the Philadelphia mint buys all its supplies and common metals by one kind of weights and measures, its precious metals by another, and does all its laboratory work by a third, this latter being, of course, the metric system. As at least a step in the right direction, he cites the frequent use in drawings of a derimal division of feet and inches

As to the best means of generalizing the use of the metric system in the United States, Dr. Samuel W. Stratton, director of the Bureau of Standards, writes. "Commerce, technology, and science have, on account of their international character, availed themselves of the advantages of the metric system more than manufacturing, which is local, and, unlike exporting, not in direct touch with world markets. Hence science and commerce with their world-wide outlook should be the advisers of industry, and their conclusion is that the first principle is to supply what the customer needs, and that international business requires international weights and measures."

As to one of the great merits of the system, we have the following emphatic opinion from the late Lord Kelvin (William Thompson, 1824-1907): "I believe I am not overstating the truth when I say that halt the time occupied by clerks and draughtsmen in engineers' and surveyors' offices. I am sure at least one-half of it—is work entailed upon them by the inconvenience of the present larriago of weights and measures. The introduction of the French Metrical System will produce an enormous saving in business offices of all kinds—engineering, commercial, and retail shops."

ing commercial, and retail shops."

The Rt. Hon. Arthur J. Balfour, replying in 1895 to a deputation advocating the intoduction of the system in England, used the following words: "Upon the merits of the case I think there can be no doubt whatever that the judgment of the whole civilized world, not excluding countries which still adhere to the antiquated systems under which we suffer, has long decided that the metric system is the only

rational system."

As a step in the direction of the metric system, the decimalization of the coinage has found some favor in lingland recently, the present florin (a two-shilling piece) being proposed as a new monetary unit since it is exactly one-tenth of a pound sterling. As the British farthing is one ninety-sixth of a florin, an exceedingly trifling reduction of its value would make of it a "cent" representing the one hundredth part of the florin, and worth only a very small fraction less than one-half of the United States or Canadian cent. Another idea has been to add ten-pence to the value of the pound, which would then contain 250 pence or 1,000 farthings of unchanged value. A new florin, as the tenth of this new pound, would then be worth 100 farthings. It is interesting to note that the proposition to decimalize the British coinage by making the florin, the tenth part of a pound sub-dividing it into hundredths, has for several years been essentially introduced in Peru, where

the gold *libra*, coined as an exact equivalent of the British pound sterling, is divided into 10 silver *soles*, the sol thus being worth exactly \$0.48005, or the same as the British florin. The sol is in turn divided into 100 centavos worth

0.48665 cent of our money

Probably no profession would benefit to a greater extent by the introduction of the metric system in the United States and Great Britain than would that of mining-engineering. This is eminently an international science, and to maintain a place in the first rank of his profession the mining engineer must keep himself constantly informed as to the latest methods and improvements introduced in foreign lands Wherever the metric system is employed, all the data on this profession are expressed in metric When, however, the weights and measures United States engineer wishes to use these data in connection with his own work, or to compare them with those recording native methods and machinery, he is torced to make a number of very tedious calculations before he can arrive at any exact companisons. An approximate idea he may indeed quickly gain, but in any exact science all mere approximations are practically useless

The metric system has for some time been in exclusive use in the medical department of the United States army, and with the entry of the United States into the war against the Central empties, it was used in the manufacture of certain sizes of guns, notably in those conforming to the Lamous French "75's," the 75-millimeter guns that have proved their superiority to the other field attillery of similar size and also of the 105 millimeter and the 155 millimeter guns. The General Chief of Staff wrote in January 1918, that it was followed in the preparation of operation orders and in map construction for the troops in France, as well as for firing data for artillery and machine guns to be used there. The artillery and machine gun material intended for service abroad was modified to conform with metric measurements.

Another step in furtherance of the adoption of the metric system is one that has recently been taken in the gem-dealers' industry concerns the adoption, in precious stone commerce, of an international metric carat of 200 milligrams, to take the place of the various and discrepant national carat-weights that have for so long been sources of serious annoyance, in-convenience and loss of time for gem-dealers In a paper read in Chicago before the International Congress of Weights and Measures, held in connection with the World's Columbian Exposition of 1893, the writer suggested dividing the carat into 100 parts, and constituting a standard international carat of 200 milligrams, that is, 5 carats, or 20 pearl grains, to a French gram. This represented a depreciation in weight of only about 2½ per cent from the carat-weights most in use. Great credit for having definitely initiated this much-needed reform is unquestionably due to M C E. Guillaume, Director of the Bureau International des Poids et Mesures at Sèvres, who energetically and successfully advocated the reform in 1906 before the Commission des Instruments et Travaux, in Paris.*

Simplicity of the Metric System.—There

is only one system of weights and measures in the world by means of which, if a voyager were wrecked on a desert island with only one measure, and that so small that it could be put in a lady's thimble, he could reconstruct all the measures for distance, for weight and for capacity, could map out the island, weigh up to tons and know the capacity of any receptacles he might construct. That system is the metric system, and that measure is the cubic centimeter, made hollow, and graduated on the edge in millimeters.

Having this, he could mark a stick up to a meter, dividing it into decimeters, centimeters and millimeters. This meter multiplied a thousand times would give him the kilometer—the standard measure of distance. It would also enable him to determine how many square meters the island measured, and hence how many ares (100 square meters) and hectares (10,000 square meters) it covered in area. Or, he could fill the cubic centimeter with water, which would weigh one gram, and multiplying this by a thousand would give him a kilogram, the standard measure of weight. The cubic centimeter would hold one milliliter of water and 1,000 milliliters would give him the liter the standard measure of capacity.

The meter for the unit of length, the liter for the unit of capacity and the gram for the unit of mass or weight is the sum and substance of the metric system. These three units (meter, liter, gram) with the following divisions and multiples are winning their way into general use because they are best suited for

practical purposes.

The prefixes from the Latin, milli; centi; deci; representing respectively a thousandth, a hundredth and a tenth, and those from the Greek, deka, hecto and kilo representing respectively 10, 100 and 1,000 may be used with any of the metric units Investigation and experience in the United States and in metric countries, however, indicate the desirability of holding to the metric weights and measures given in the foregoing table, as these are considered sufficient and best for professional work, the industries and trade. Ten meters, for instance, is briefer and more readily understood than one dekameter

The metric weights and measures were all based on the unit of length. The liter, the unit of capacity, is almost exactly equivalent to a cubic measure 10 centimeters on each edge or 1,000 cubic centimeters (cm³ or cc). As greater accuracy could be obtained by basing the unit of capacity upon the unit of mass, the definition was written as follows. "A liter is a unit of capacity equivalent to the volume occupied by the mass of one kilogram of pure water at its maximum density at a temperature of 4° C. (39 2° F) and under the standard atmospheric pressure of 760 mm." One milliliter, equivalent to 1000027 cubic centimeters of water, weighs one gram Technically, however, the gram is one thousandth of the kilogram, which is the standard for mass or weight

^{*}G F Kunz, The International Language of Weights and Measures, *The Scientific Monthly*, Vol IV, No 3, March 1917, pp 215-219, paper read, as retiring chairman, before Section I (Social and Economic Science) of the American Association for the Advancement of Science, in New York City, 27 December 1916.

(TABLE OF THE METRIC SYSTEM AND FQUIVALENTS

Correct English spelling			Standard abb	reviations
Length	$ \begin{cases} 10 \text{ millimeters} \\ 100 \text{ centimeters} \\ 1000 \text{ meters} \end{cases} $	- 1 centimeter = 1 meter = 1 kilometer	10 mm 100 cm 1000 m	1 cm 1 m 1 km
Capacity	1000 milliliters	= 1 liter	1000 ml	1 1
Weight	$\begin{cases} 1000 \text{ nulligrams} \\ 1000 \text{ grams} \\ 1000 \text{ kilograms} \end{cases}$	= 1 gram -1 kilogram = 1 metric ton	1000 mg 1000 g 1000 kg	1 g 1 kg 1 t

LENGTH.

1 centimeter	= 0 3937 inch	1 meh = 2,5100 centimeters
1 meter	= 3 2808 feet	1 toot = 0,3048 meters
1 meter	= 1 0936 yards	1 yard = 0,9144 meters
1 kilometer	= 0 6214 statute mile	1 statute unle = 1,6093 kilometers
1 kilometer	= 0 5396 nautical mile	1 nautical unle = 1,8532 kilometers

CAPACITY

1 milliliter 1 milliliter 1 liter 1 liter 1 liter	== 0 2705 U S fluid drachin == 0 0.338 U S fluid ounce == 1 0567 U S liquid quarts == 0 9081 U S dry quart == 0 2642 U S gallon	1 U. S. fluid drachin 3 6966 milliliters 1 U. S. fluid ounce 9 5779 milliliters 1 U. S. dry quart 1 0 9463 her 1 U. S. dry quart 1 1012 liters 1 U. S. gallon 3 7853 liters
1 milliliter	0 2816 British fluid diachm	1 British fluid driehm — 3 5515 milliliters
1 milliliter	0 0352 British fluid ounce	1 British fluid omice — 28 4123 milliliters
1 liter	0 8799 British liquid quart	1 British liquid quart — 1 1365 liters
1 liter	0,2200 British imperal gallon	1 British imperial gallon — 4 5400 liters

MASS OR WEIGHT.

MAD OK A PROTEIT				
1 gram 1 gram 1 gram 1 gram 1 gram	= 15 4324 grams = 0 6130 pennyweight = 0 7716 apothecaries' scruple = 0 2572 apothecaries' drachm = 0 0353 avoirdupois ounce = 0 0322 troy ounce	1 gram = 0 -0648 gram 1 pcmyweight = 1 -552 grams 1 apothecaries' cruple = 1 -2960 grams 1 apothecaries' drachm = 3 -8879 grams 1 avondupor ounce = 28 - 3495 grams 1 troy ounce = 31 -1035 gram s		
(1000 kilogra	= 2 2016 avoir lupors pounds = 2 6792 troy pounds = 0 9842 long tons (2240 lbs) ms)	1 avoirdupors pound = 0 4536 kilogram 1 troy pound = 0 3532 kilogram 1 long ton = 1 0160 metric tons (1000 kilograms)		
1 metric ton	== 1 1023 short tons (2000 lbs.)	1 short ton 0 9072 metric ton		

The equivalents given in this article are based upon the following fundamental equivalents:

39 370000 United States inches --- 1 meter

== 0.0610 cubic inch

1 milliliter

A quantity can usually be expressed as a whole number if the proper metric weight or measure is selected. Even when a fraction is needed to express the metric equivalent of another weight or measure, one or two figures to the right of the decimal point generally give sufficient accuracy. Equivalents such as those in the tables here given are intended to be used only to the required degree of accuracy. For example, four inches is equal to about 10 centimeters; if greater accuracy is desired 10.2 centimeters or 10.2 millimeters may be taken.

meters or 102 millimeters may be taken.

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GEORGE F. KUNZ.

METROPOLIS, Ill., city and Massac County seat, alt. 329 feet; on the Ohio River; 15m. NW. of Paducah, Ky.; on the Burlington;

Illinois Central; and Paducah and Illinois railroads; has barge line service on the river. Here crates, baskets, tool handles, and railroad ties are made, also underwear, gloves, and turniture. The city has a Carnegie library, a hospital, and a courthouse. Near by, in 1757, Fort Massac was built by the French; it was destroyed by the Cherokee Indians; its site was occupied by the British from 1765 to 1778; and the fort was rebuilt by "Mad Anthony" Wayne (qv.) in 1794. A neighboring settlement became the city of Massac; between it and the fort was Metropolis City, which in 1843 became county seat. The two crites were merged under the present name in 1892. In 1908 the site of the fort was designated as a state park. It was here that George Rogers Clark (qv.) crossed the Ohio on his way into the Northwest Territory; a statue of him stands in the park. Pop. (1940) 6,287.

1 cubic inch 16 3867 milliliters

METROPOLITAN, the Greek name of an archbishop, whose see is the chief place or metropolis of a province. The metropolitan is above the bishop, but below the patriarch. The title of patriarch, however, is in use only in the Eastern churches. In Russia the metropolitan is at the head of the hierarchy. In the Roman Catholic Church an archbishop may bear this title even though he does not have a metropolis as a see, thus the archbishop of Westminster is styled metropolitan.

METROPOLITAN MUSEUM OF ART. See Art, Mitropolitan Museum of.

METTERNICH, mět'těr-nřii, Clemens Wenzel Nepomuk Lothar, Prince, Austrian statesman: b. Coblenz, 15 May 1773; d. Vienna,

He was educated at Strassburg; 11 June 1859 when only 17 represented the Westphalian princes at the coronation of Leopold II; settled in Vienna in 1794; and assured himself a place in diplomacy by marrying the granddaughter of the Austrian chancellor, Kaumtz, in 1795 This marriage not only gave him entiry to the best society, but brought wealth, and at the Congress of Rastatt he represented the Westphalian collegium, where he served his apprenticeship in politics. In 1801 he was sent to Dresden by Austria, two years later to Berlin; there a part of his mission was to cultivate the friendship of the French Ambassador He did this so well that that official induced Napoleon to suggest to Austria that Metternich would be a most acceptable representative at the Tuilenes; and so in 1800 he was sent to Paris, where he ingratiated himself with Caroline Murat, sister to Napoleon, and with Tallyrand On the outbreak of the war between France and Austria, Metternich was put to much personal inconvenience by Napoleon, who forcibly detained him for some time. Thereafter he entered eagerly into the anti Napoleonic league; assisted in the formation of the Quadruple Alliance; and as Germany proved successful, took no part in the national sentiment which arose, but directed himself solely to the aggrandizement of Austria, hence doing his best to preserve the French boundaries as they had been and to render Austria the only gainer among the powers by the reapportionment of Europe He is credited with having planned and brought about the marriage of Napoleon and Maria Louise. In the years that followed he carried things his own way in Austria, planned the Holy Alliance and was extremely reactionary in his internal and foreign policies. In the difficult times of Napoleon's supremacy and his fall Metternich guided Austria policies with a masterly hand As a diplomatist he was the equal of any of his time In 1814 he visited England and formed the quadruple alliance. He was the master spirit at the Congress of Vienna and for 15 years thereafter was the leading statesman of Europe The Revolution of 1830 in France showed the ill-success of his program; and the rising of 1848 and the insurrection in Vienna itself made it necessary for the Emperor Ferdinand to demand his resignation He kept some power even then, his counsel being frequently sought Consult Malleson, 'Life of Prince Metternich' (1888); Sandeman, J. A. C., 'Metternich, Life and Career' (New York 1911).

METUCHEN, N. J., borough in Middlesex County; alt. 100 feet; om NE. of New Brunswick; on the Pennsylvania Railroad A residential suburb, it was settled in colonial times. Pop. (1930) 5,748; (1940) 6,557.

METZ, mets. France, an important fortified city and episcopal see of Alsace-Lorraine, on the Moselle, which here divides into several arms, 79 miles northwest of Strassburg. It is the third city of Alsace-Lorraine and has several representatives in the French Chamber of Deputies. The major part of the town stands on a height within the fortifications, outside of which there is a series of strong detached forts of excessive strength. Metz is also the forts of excessive strength. centre or seat of control of the group of forts which includes Diedenhofen and Bitsch. In 1912 the German garrison numbered 25,000. The

cathedral is a late Gothic structure, surmounted by a spire of open work 397 feet high There are imposing public buildings The manufactures consist of woolens, cottons, hosiery, hats, muslin, glue, leather, etc. Several battles were fought in the neighborhood and under its walls between the Germans and French in August 1870 The Germans subsequently invested the town and, being reduced to a state of famine, on 28 October it capitulated with 180,000 of ficers and men under the command of Marshal Bazaine The near-by cemetery of Chambiere holds the remains of over 7,000 French soldiers who perished here. It was included in the cession of territory to Germany at the Peace of 1871 Metz was anciently known as Divodurum, and later the Romans rechristened it Medio-matrica, of which Metz is a contraction. The Romans built military roads through the territory, and a fine aqueduct, of which traces remain. Attila sacked the town in the 5th century After the retirement of the Huns, the Franks obtained control and made it the capital of Austrasia. In 870 it was included in East Francia, and developed under German influence Its prosperity increased, and in the 13th century, as a free imperial city, it attained the zenith of its prosperity. It was taken by the French in 1553 This ownership was later confirmed by the Peace of Westphalia in 1648 Thereafter it remained until 1870, with the rest of Alsace-Lorraine, a peaceable French territory For its history in 1870-71, see Franco-GERMAN WAR Marshal Pétain entered the city at the head of the Tenth Army on 19 Nov. 1918 amid great rejoicing. After 47 years of German domination Metz was reunited to France. Pop. about 70,000.

MEUDON, mè-dôn, France, a town south-west of Paris, near the Seine, on the railway to West of Paris, near the Seine, on the land, we Versailles, six miles to the west. It had formerly a fine château, built by Louis XIV, surrounded by the Forêt de Meudon, still a beliday resort of the Parisians. This favorite holiday resort of the Parisians château was fitted up in 1812 by Napoleon I for Marie Louise, and it was a residence of the Napoleons under the Second Empire, but was ruined during the siege of Paris in 1870. An astronomical observatory has since been established in the remains of the The Duchess of Galliera established here a home for the aged and for orphans, at a cost of \$2,800,000. Meudon has glass-works, bleach-fields, extensive government munition works and other industrial establishments. Rabelais was for a short time curé of Meudon. Pop of commune about 17,000.

MEULEN, me'len, Adam Frans van der, Flemish painter b Brussels, 11 Jan 1632; d. Paris, 15 Oct 1690 He studied under Snayers; removed to Paris; and there became court painter to Louis XIV, for whom he painted

many battle scenes.

MEUNIER, mē-nē-ā, Constantin, Belgian artist b. Brussels, 1831; d. there, 4 April 1905 He is known as a historical and genre painter as well as a sculptor of considerable power, though his naturalistic pictures are sometimes revolting; and it would seem as if his studies in Madrid had brought him under the influence of Ribera and his sanguinary school He has produced some vivid pictures of life in the colliery district amid whose unlovely surroundings he has made his home His 'Martyrdom of Saint Stephen' in the Ghent Museum is quite in the spirit of Ribera and shocks the mind by its brutal literalness (The Peasants' Rebellion') is an example of his energy and force as a realist in modern lite. His statue (The Lost Son') is in the Berlin National Gallery

MEUNIER, Étienne Stanislas, French geologist: b Paris, 1843. A student of the Paris faculty of sciences, he attained his doctor's degree in 1869 and was laureate of the Academy of Sciences in 1878. In 1892 he was appointed professor of geology at the National Museum of Natural History. He was made a kinght of the Legion of Honor, and has been vice-president of the Geological Society of France. His chief publications are 'Le ciel géologique' (1871); 'Géologie des environs de Paris' (1875; rev. ed. 1912); 'Geologie tégionale de France' (1889); 'La géologie comparée (1895), 'Nos terrains: géologie populaire' (1898); 'La geologie genérale' (1903); 'La géologie expérimentale' (1904); 'Les convulsions de l'écorce terrestre' (1910).

MEURICE, Francois Paul, fran-swh pôl me-tês, French dramatist b Paris, 1820; d there, 11 Dec 1905. He was educated at the Collége Charlemagne and entered upon a literary career He worked for a time in collaboration with Dumas, with whom he made a translation of Hamlet, and was entrusted by Victor Hugo, his brother-in-law, with the publication of his complete works. He published Benvenuto Cellini (1852); Fanfan la Tulipe (1858); Cadio (1868); Césara (1869), etc.

MEURSIUS, mer'si-us, Johannes Van Meurs, Dutch scholar and historian b. Lovsduinen, 1579; d 1639 Besides 'Glossatium Græco-Barbarum' (1614); and 'Athenæ Batavæ' (1625); for his edition of Greek authors he wrote numerous introductory essays which J.F. Gronovius reprinted in 'Thesaurus Antiquitatum Græcarum' His complete works were edited by Lami (12 vols., Florence 1741–63)

MEUSE, mez, or muz, river which rises in France in the south of the department Haute-Marne, and with a northward trend crosses the northwestern corner of the department Vosges where between Bazielles and Noncourt it has a subterranean course of three and a half miles. It traverses the departments Meuse and Ardennes, and on reaching Sedan enters Belgium. At Namur where it receives on the left its largest tributary, the Sambre, almost doubling its volume, it changes its course to northeast, and passes Liège, where it is augmented by the Ourthe; it separates Dutch from Belgian Limburg, passing Maestricht and Roermond, at the latter of which it receives the Roer. In the northern part of Dutch Limburg its course is changed to northwest, and subsequently it be-comes west. The whole of its after-course is through the Netherlands, in which it forms for some distance the boundary between North Brabant and Gelderland. It finally joins the left bank of the Waal, one of the arms of the Rhine, and gives its name to the accumulated flood of these streams, which, proceeding west through Holland proper, is divided near Dordrecht into two great rivers, the one of which bends round to the north and reaches Rotterdam; the other

branch continues west; shortly after the two branches again unite and discharge themselves into the North Sea. The direct length or the Meuse is 230 miles, and its length including windings is 580 miles. It is navigable for about 400 miles. A section of the Meuse River was selected by the French government before 1875 as the location for a chain of protective forts, which became known as the Meuse line. These forts extend for 31 miles from Verdun to Toul, being disposed along the astern banks of the The names of the forts are Verdun, Militel, Genicourt, Troyon, Lionville, river Saint Samt Agnant, Gironville, Jous sous les Cote and Tours There was also constructed a second line of forts from Payny to Neutchateau. This region saw some of the heaviest fighting of the Great World Wat. See WAR, EUROPEAN

MEXCALA, mas ka'la, or MESCALA, mes ka'la, a river of Mexico, in the southern part, which has its rise in the mountains southeast of the City of Mexico, and flows generally west for 450 miles to the Pacific. It is called Atoyac in the first part of its course, and on the boundary line between the states of Michoacan and Guerreto, it is called Rio de las Balsas. The port of Zacatula is at its mouth It is a swift flowing stream, and has a number of low cascades and tapids.

MEXIA, ma-he'a, Texas, city in Limestone County, alt 534 feet; 20m SE of Corsicana; on the Southern Pacific, and Burlington-Rock Island railroads. In 1920 there was an oil boom here, but now the oil industries are second to agriculture in contribution to the city's prosperity, and cottonseed oil, textiles, and machinery are the principal products of its industry. It has the commission form of government. Pop (1930) 6,579; (1940) 6,410.

MEXICAN ARCHÆOLOGY. See Mex-ICO — PITINOLOGY.

MEXICAN HAIRLESS DOG, a small terrier-like dog, of uncertain origin, without hair except a tuft on the crown of the head, another on the tail and a few scattering wisps on the body; the skin is gravish black, wrinkled and dry Clavigero describes a large hairless dog found among the Mexicans by the Spanish conquerors, whose puppies were esteemed as an edible delicacy; and others are recorded as having occurred in ancient Peru and on various of the West Indian islands.

MEXICAN JUMPING BEAN. See Jumping Beans

MEXICAN LITERATURE. See MEXICO — LITERATURE.

MEXICAN NUN, The, name given to JUANA INEZ DE LA CRUZ, Mexican poet: b. San Miguel de Nepantla, near Mexico, 12 Nov. 1651; d. Mexico, 17 April 1695. She was well known in Mexico for her learning, took the veil in the convent of San Jerónimo, after some 27 years abandoned her studies wholly for the duties of the convent, and sold her library in aid of charity. Her death occurred during a severe epidemic. Among her works are 'Poésias Sagrades y Profanas'; 'El Neptune Alegórico', and the comedy 'Los Empeños de Una Casa.'

MEXICAN ONYX, a stained and banded

variety of Calcite It is not true onyx. See CALCITE, ONYX

MEXICAN SUBREGION, a faunal district of the Neotropical region embracing the low hot coast region of Mexico. See Zoogeography

MEXICAN TEA, See GOOSEFOOT.

MEXICAN WAR, The. The annexation of Texas in 1845 laid the foundation for the war with Mexico Although Texas had been for many years practically free, and had been recognized by the United States, England, France and other countries, yet Mexico still refused to acknowledge its independence. When therefore the United States proposed to admit Texas into the Union, Mexico gave warning that the annexation would be equivalent to a declaration of war, and 6 March 1845 protested, and soon afterward withdrew her Minister and severed diplomatic relations. Her acts, however, scarcely justified her threats, as at that time at least little or no preparation was made It has, therefore, been claimed that had the American government used a conciliatory policy peace might have been preserved, and friendly relations re-established.

At the moment, however, the Mexican people and authorities were in a rather belligerent attitude, due in part to pride, and in part to an expectation that the United States would soon be involved in a war with Great Britain over the Oregon boundary, in which case Mexico would have a powerful ally to aid her. Did President Polk at this point seek to strengthen this hope in the minds of the Mexicans, intending at the proper moment to make a compromise and peace with England, as was done, and thus leave Mexico at the mercy of the United States? Perhaps history can never answer the question, but events at least seemed to march in harmony with the thought For Mexico soon found herself in the dilemma that she must either sell California to the United States, receiving in return a goodly sum of money to appease her pride, or engage in a war to sustain her honor and territorial integrity. Mexico bravely, but perhaps not wisely, chose the latter alternative, not fully realizing the inequality of the contestants, nor the depth of the humiliation to which she would be subjected. Doubtless President Polk preferred to acquire California without war; but its acquisition was to be the principal measure of his administration. Hence if war was the only means to secure it, war it must be; at least enough to get

possession of the desired territory.

Causes of the War.—The immediate occasion, however, of the war was the dispute in regard to the western boundary of Texas. Proclaiming her independence in 1836 Texas asserted that her western boundary was the Rio Grande to its source, thence due north to the 42d degree of north latitude. The following year the United States recognized her independence, and in December 1845, by a joint resolution, admitted her into the Union as a State, providing that boundary disputes were to be settled by the United States President Polk accepted the boundary line claimed by Texas, and 13 Jan. 1846 ordered Gen Zachary Taylor to march to the eastern bank of the Rio Grande as the western boundary of the United States. Mexico insisted that the Nueces River

— 100 miles eastward — was the true western boundary of Texas, and therefore that General Taylor was now on Mexican soil. On 25 April 1846, the first blood was shed in a conflict between a band of Mexican troops that nad crossed to the eastern side of the Rio Grande and a company of American soldiers. The news of this action was immediately communicated by General Taylor to President Polk, who sent his now noted message to Congress, asseiting that war was begun by the act of Mexico on American soil. Congress accepted, after a stormy debate in the Senate, the President's statement, and war was recognized as existing.

Other causes than the two already noted were also at work, and help to make a decision in regard to the justness of the war still more difficult Mexico for many years had been in a chronic state of revolution. The natural result followed. American citizens in Mexico sustained property losses and doubtless were frequently unjustly arrested and even imprisoned. Claims arising from these causes had been in part settled under a convention of 1840; but many of them were still pending. Some were just; more, either unjust or extravagant in amount Piesident Polk united these unsettled claims with the boundary question, and demanded that Mexico receive an envoy extraordinary with power to settle both - on its face an eminently fair proposition. On the other hand, Mexico professed to be ready to receive an ambassador to settle the boundary dispute, but declined to receive Mr Slidell as our minister when commissioned to settle all disputes, insisting that the two questions were distinct in kind and origin and should not be united. President Polk in his message asserted that this action of Mexico was in violation of her promise to receive a minister, and hence justified his administration in its measures, and forced him to take possession of the disputed territory.

The need of more slave territory was perhaps another factor in causing the war. At least many from the South took an aggressive position on all questions in dispute between the two countries and thus made a peaceable settlement more difficult. Both the economic and the political reasons for more territory began to be felt by 1846—the one to have new soil over which to spread the land-exhausting system of slavery; and the other to have new territory out of which to carve new slave States that the equilibrium between slave and free States might be maintained. Some other forces tending to arouse the war and aggressive spirit may be noted. The cry of "manifest destiny" played a part Many, especially in the West, felt that the Pacific Ocean was the natural western boundary of the United States. They also demanded the "Golden Gate" that commerce might be opened up with the Orient The two great parties—the Whigs and the Democrats—divided quite sharply on the question; in fact so completely that the war became almost a party, instead of a national, issue. The Democrats, as a rule, supported the administration and its claim that the war was just. The Whigs, on the contrary, asserted that it was a most unholy and unrighteous war, and characterized it as Polk's war Lincoln, entering Congress in 1847, became a severe critic of the

policy pursued, while Tom Corwin of Ohio went so far as to use this language "If I were a Mexican I would tell you, 'Have you not room in your own country to bury your dead men? If you come into mine we will greet you with bloody hands, and welcome you to hospitable graves?"

President Polk summarized his reasons for recommending that Congress recognize war as existing as follows: "The grievous wrongs perpetiated by Mexico upon our citizens through out a long period of years remain unrediessed; and solemn treaties... have been disregarded... Our commerce with Mexico has been almost annihilated." He then adds "As war exists, and ... exists by the act of Mexico heiself, we are called upon, by every consideration of duty and patriotism, to yindicate, with decision the honor, the rights, and the interests of our country"

The Campaigns.—The war with Mexico was accepted as a fact by Congress 13 May 1846. There were four principal fields of action in its prosecution (1) Along the Rio Grande, under the command of Gen. Zachary Taylor, (2) in California, where Capt. John C. Frémont and Admiral Stockton were in command; (3) in New Mexico, with Gen. Stephen W. Kearney leading the American forces; and (4) from Vera Cruz to the City of Mexico, under the command of Gen. Winfield S. Scott, the commander-in-chief of the American armies. Everywhere success attended the American arms. Perhaps it was the first war in history, lasting two years, in which no deteat was sustained by one party, and no victory won by the other.

General Taylor defeated the Mexican troops at Palo Alto 8 May; at Resaca de la l'alma the following day and captured Matamoras on the 18th. He remained near that city for some weeks to recruit his army and prepare to advance into the interior. On 24 September he entered Monterey, after a siege of four days, and a gallant resistance by the Mexicans. Taylor's most famous victory, however, 'was won 23 Feb. 1847, at Buena Vista. General Scott gave orders, which unfortunately fell into the hands of Santa Anna, the Mexican general, for General Taylor to send some nine regiments to aid Scott in his proposed attack on Vera Cruz. Santa Anna immediately marched his whole command against Taylor, expecting to crush him in this weakened condition. It was 20,000 men against about 5,000. But the skill of Taylor, the persistence of his army, the organization and equipment of the American troops, won a great victory. Taylor became the hero of the hour, and Buena Vista made lum an irresistible Presidential candidate.

Frémont's course in California has been a subject of keen controversy. As leader of an exploring expedition he was already in northern California, and early in 1846 was recalled to the Sacramento Valley. California was the goal of the political policy of Polk's administration. The means to secure its acquisition were uncertain. It might be gained by war; or by filling the territory with American settlers who in course of time might bring it into the Union as Texas had already been annexed; or timight be effected by securing the goodwill of the native Californians who were already jealous of Mexican rule. The latter policy

seems to have been the one adopted by the adterey, Mr Larkin, was developing this policy with a good prospect of success, it is claimed when Frémont appeared on the scene He seems to have developed a fourth policy, namely, the establishment of an independent government under the control of the American settlers in the Sacramento Valley. This movement resulted in the "Bear Plag Republic," and virtual civil war between the native Califormans and the American settlers. At this moment the Mexican War began and the Bear Flao" was replaced by the "Stars and Stripes" It has been claimed by some California histomans that Fremont's course, had not the Mexican War come at the moment it did, might have lost California to the United States The native Californians, alienated as they were by his course, might have put themselves under an lenglish protectorate in revenue for the treatment accorded them. Be this as it may, by the end of the year all California was conquered and held by American troops, and Frémont was regarded as the hero who had won the "Crolden Gate" by his energy and decision. Santa Fé was captured by General Kearney, and New Mexico secured with almost no loss of life By the end of the year, therefore, all the territory that the administration desired was in the possession of its armies, but Mexico was still une

Scott had been chafing in Washington dur ing the summer and tall of 1846 while Taylor was winning his brilliant victories. He asked to go to the front to assume chief command. but the administration retained him at the capital under the plea of needing his advice. As it happened this Democratic war was officered by Whig generals. Scott had already been a Whig candidate for President The chaige was now made that Scott was kept from command for fear that success might make him a more formidable candidate in 1848. Finally, when he was sent to the front in January 1847, the cry was raised that the purpose was to dim the lustre of Taylor's victories, or at least to divide the popular support between the two generals in such a way as to destroy the political prospects of both.

General Scott invested Vera Cruz in March 1847, and by the 27th had captured the fortress which had been thought to be almost impregnable, and was ready to enter the city. On 8 April he started into the interior, and on the 18th captured Cerro Gordo; the 19th, Jalapa, and the 22d Perote. On 15 May he entered the important city of Puebla Remaining here for some weeks he again advanced, in August, toward the capital, and on the 10th came in sight of the city of the Montezumas. Two important victories were won 20 August—at Contreras and at Churubusco. He captured Molina del Rey 8 September, and five days later the victory of Chapultepec gave him the City of Mexico itself which he entered on the following day with an army of only 6,000 men. The war was practically over, but the victory was so complete that it began to be a question whether there was any government left with sufficient power to negotiate a treaty of peace. An agitation began with friends both in and out of Congress, as well as in the cabinet, looking to the annexation of the whole of Mexico. Calhoun on the one hand, Webster and a majointy of the Whigs on the other, joined hands to defeat this plan President Polk was finally torced to make the ultimate decision N. P. Trist was sent in March 1847 to Mexico to make a treaty of peace. Failing he was ordered in the fall to return to Washington; but disobeying instructions he remained in Mexico, and on 2 Feb. 1848 concluded a treaty of peace in harmony with his original instructions. The administration was in a quandary. To ratify meant to condone the disobedience of Trist To reject meant a prolongation of the war, and time to perfect the intrigue for the annexation of "All Mexico" President Polk after some hesitation, decided to send the treaty to the Senate for its consideration. Received 23 Febmary, it was ratified, after some amendments, 10 March, by a vote of 38 to 14 On 30 May ratifications were exchanged and the war was at an end

The Mexicans had fought bravely, even stubbornly and at times skilfully, yet in every cortest, even when the odds were greatly in their favor, without a single victory. In part superior leadership and training won for the soldiers of the northern republic, in part their cooler and more persistent character, but in the main it was not bravery, nor generalship, nor even character that won. It was science and education applied in the equipment of the armies, the guns of the soldiers, the cannon on the raniparts and the powder in the arsenals which made the one so much more effective than the other that the most daring bravery

was no counterpoise.

The Treaty of Peace.—The treaty of Guadalupe Hidalgo gave to the administration of President Polk the territory that his diary informs us he intended to acquire, California and New Mexico. Mexico in return for the loss of its fairest northern provinces was paid \$15,000,000, and released from all claims of all kinds held by citizens of the United States against her, estimated at \$3,250,000, which the United States assumed Boundary lines were drawn, and provision made in regard to other questions at issue between the two countries

Results.- Usually successfully waged wars redound to the credit of the party in power. In this case, however, the Democratic party, the author and supporter of the war, was defeated by the Whig party, the party of opposition and criticism, in the Presidential election of 1848. The Whigs made use of the popularity of a successful general to deleat the party that had made his glory possible. Evidently the American people were ready to accept the fruits of the war, but also ready to punish the party they believed had wrought in a wrong manner. A large number of young officers, destined to renown in later years proved their worth in this war. U.S. Grant and Wm. T. Sherman, Robt E. Lee, "Stonewall" Jackson and Jefferson Davis, in the great Civil War, foreshadowed, in this Mexican struggle, the greatness that was to be theirs in the "days that tried men's souls" from 1861 to 1865. The acquisition of 522,568 square miles of territory—an empire four times as large as Great Britain, was the most important immediate as well as remote result It was important in the issues that its acquisition precipitated. Should it be slave or free territory? Who should determine its institutions? Out of this question grew the larger

one, who had the right to control the institu-tions of the territories in general? To settle the first question David Wilmot, a Democrat of Pennsylvania, proposed the celebrated "Wilmot Pioviso" (qv) which would exclude slavery forever from all territory acquired from Mexico Four long years of intense and bitter de-bate followed. This question and a series of others were settled temporarily in the Compromise of 1850. The second question was answered by the phrase "Non-intervention," which meant, or soon came to mean, one thing to Douglas and the Northern Democrats, and another to Davis and the South Three main theories were evolved or defended in answer to (1) That Congress had the the third query right to control the institutions of the Territories and could make them slave or free at its will (2) The Dickinson-Cass-Douglas doctrine of Popular or "Squatter" sovereignty: the doctrine that the people of a territory themselves, while yet in a territorial status, determined their own institutions (3) The radical Southern view that slaves were property, and, as property might be taken into any Territory,—the common public domain of the States, -with no constitutional power anywhere to hinder or prevent. It was important secondly in its industrial and political effect on the na-tion. The United States now had an outlook on the Pacific Ocean comparable to that on the Atlantic. China, Japan and the East were brought within the circle of its influence Conditions favorable to further expansion were prepared In addition to the great effect on commerce thus prefigured, that on wealth and industry was not less. The gold, silver, copper and other mineral wealth of the Rocky Mountain region was turned into the pockets of the American people This vast addition of territory and wealth tended also to emphasize national pride and ambition, to arouse a still more intense belief in "manifest destiny"; to develop a more optimistic tone, and perhaps also to produce a more materialistic spirit.

also to produce a more materialistic spirit.

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MEXICO (Sp. Ménco, officially República Mexicana and Listados Unidos Mexicanos), the southernmost country of North America and a federal republic, situated between 14° 30′ 42″ and 32° 42′ north latitude, and between 86° 46′ 8″ and 117° 7′ 31″ longitude west of the meridian of Greenwich. Its name is closely allied with the group of tribes who called themselves Mexica or Asteca The name is derived from the tribal war-god, Mexitl, also called Huitzilopochili. The Spaniards gave the name Mexico to all the countries in which they found the Aztecs supreme at the time of the Conquest Mexico is one of the most interesting countries of the Western Hemisphere, because of its aboriginal civilization and social customs, many of which have persisted to the present. It is also important because of its great natural resources, many of which are now being developed These topics, together with the geography, art, architecture, hterature, music, history, ethnology, commercial and political life are here treated under the following headings

10 Education Area, Boundaries, etc. 2. Minerals and Mineral 11 Production 12 12 Mythology. 3. Agriculture and Stock-13 Art Architecture. raising 15 Ethnology 4. Commerce 16 Literature. Manufactures 16A Music 17 History Transportation and Communication 18 Diplomitic Relations 7. Banking and Finance. with the United States 19 Cultural Relations with 8. Government 9. Aimy and Navy. the United States

1. AREA, BOUNDARIES, ETC. Mexico's total area is 767,198 square miles, and its boundaries are the United States on the north, Guatemala and Belize on the southeast, the Pacific Ocean on the south and west, and the Gulf of Mexico and the Catibbean Sea on the east. Its coast line on the east is 1,772 miles in

length and on the west or Pacific side, 4,594 miles. The northern of United States boundary was fixed by treaty 2 Feb 1848 and 30 Dec 1853, and extends from the mouth of the Rio Grande, on the Gulf of Mexico, following that river a distance of 1,130 miles, beyond El Paso, Texas, thence to a point on the Pacific Ocean, one marine league due south of the southernmost point on the Bay of San Diego. The total length of the northern boundary line is 1,833 miles. The Guatemalan boundary line was fixed by treaty 27 Sept. 1883 and 1 April 1895, and the Belice line by treaty signed 8 July 1893 and ratified 19 April 1897. The length of the southern boundary of Mexico is 642 miles.

By the freaty of Guadalupe Hidalgo, ratified 2 Feb 1848, and the Gadsden treaty of 30 Dec 1853, Mexico ceded to the United States 930,590 square miles of her territory, or 163,264 more than half. The first named treaty miles of domain, now part and parcel of the United States, as follows: Texas, 265,780 square miles, Colorado (in part), 18,000, Kainsas (in part), 7,760, New Mexico, 65,201, Oklahoma, 5,740, Under the terms of the second or Gadsden treaty the United States acquired 5,22,568 square miles, which are now held as follows: Arizona, 82,381, California, 157,801, Colorado (in part), 29,500; Nevada, 112,000, New Mexico, 42,000, Utah, 84,470; Wyoning (in part), 14,320 By virtue of the same treaty a later addition was ceded, consisting of 31,535 square miles to Arizona and 14,000 to New Mexico

Political Divisions and Population.—Mexico is divided politically into 28 states, two territories and a federal district. These with their areas and populations, capitals and populations, are as follows:

State	Area (m. square miles)	Population	Capital	Population
Aguascalientes Campeche Chiapas Cohinaliua Coahuila Colima Durango Federal District Guanajuato Guerrero Hidalgo Jalisco México Michoacán Morelos Nayirit Nuevo León Oaxaca Puebla Querétaro San Luis Potosi Sinaloa Sonora Tabasco Tamaulipas Tlaxcala Veraciuz Yucatán Zacatecas Lower California (North) Lower California (South) Uninhabited Islands	2,499 30,053 28,731 91,831 58,068 2,010 47,691 57,361 1,805 24,887 8,058 31,152 8,268 23,202 1,917 10,547 25,137 36,374 13,125 4,442 24,441 22,582 70,483 9,783 30,734 1,555 27,759 23,928 28,124 27,655 27,978 1,822	132,900 84,630 529,983 491,792 436,425 61,933 404,364 1,229,576 987,801 641,690 67,772 1,255,346 990,112 1,048,381 132,068 167,724 417,491 1,084,549 1,150,425 234,058 579,831 305,618 316,271 224,023 344,039 205,458 1,377,293 386,096 459,047 48,327 47,089	Aguascalientes Campeche Tuxila Guitétrez Chihitahua Sattillo Colima Victoria de Durango Mexico City Ginanajuato Chilpaneingo de lo. Brivos. Pachia de Soto Guadalajara Toluca de Lerdo Morelia Cuernavaca Tepie Monteriey Oaxaca de Juárez Puebla de Zaragoza Ouerétaro San Luis Potosí Culacán Hermosdlo Villahermosa Cindal Victoria Tlaxeala Jalapa Enriquez Mérida Zacatecas Mexicali Lat Paz	62,244 20,125 14,849 45,595 45,272 21,117 36,3330 1,029,068 18,135 8,315 43,023 179,556 41,234 30,016 8,554 15,326 132,577 33,423 31,479 32,585 74,003 11,4795 15,395 17,682 2,493 36,812 95,015 18,800 14,842 8,166
		16,552,722		

Population.—The official statement of the Mexican government that the population of the country had increased to 8,743,014 in 1869, to 10,791,685 in 1886, to 13,607,259 in 1900 and to 15,063,207 in 1910, does not necessarily mean that the population had increased at the rate this increase in the census enumeration would seem to indicate, but rather that the gradual pacification of the country under the Diaz administration, the extension far and wide throughout the land of the administrative aims of the government, and a certain decrease in illiteracy had made the work of the census taker more effective. The disorder which followed the termination of the Díaz regime in November 1911 made census taking a difficult task over a period of 10 years of more. The 1930 official census recorded a population of 10,553,398, the esti-mated population in 1940 was 19,000,000 Fundamentally the population of Mexico is Indian and mestizo, or, in other words, is a mixture of Indian and European blood (See Mexico— Ethnology) The census of 1910 showed about 20 per cent white population, but it must be remembered that a large percentage of the so-called whites have a certain amount of Indian blood in their veins. Probably not more than 5 per cent to 10 per cent of Mexicans are pure white All, children born of Mexican parents, whether in Mexico or in a foreign land, are, in the eyes of the law, Mexican citizens; and foreigners may become Mexican citizens by naturalization by making application to the department of foreign relations, provided they have resided five years in the country.

Topography.-- In length of coast line the peninsula of Lower California leads with 1,864 miles, Yucatán following with 615, Sonora 524, Sinaloa 317, Vera Ciuz and Gueriero 286 each, Oaxaca 255, Tamaulipas 249, Campeche 224, Cluapas 137, Tabasco 119, Colima 99 and Michoacán 81 The greatest length of the groundlic in from morthwest 10 courteest 1942 republic is from northwest to southeast, 1,942 miles; and the greatest width, east and west, is from the mouth of the Rio Grande to the United States' western boundary, 1,833 miles; and the narrowest is from the bar at Coatzacoalcos (Puerto Mexico), on the Atlantic side, to San Francisco del Mar, on the Pacific, 134 miles Mexico, California and Tehuantepec are the principal gulfs on the Mexican coast, the first named being the largest in the world. In the commercial development of this continent they have performed and still perform a most important part. Mexico's great mass is the lofty Rocky Mountain plateau, which fills it almost from ocean to ocean, leaving but a narrow strip of coast Entering from Guatemala (where a spur connects with the lime-stone and coral tableland of Yucatán), the system trends west, forming a tableland 150 miles wide at Oaxaca, with a steep descent and slender coast on the Pacific, but a more grad-ual one by terraces to the Gulf of Mexico in Tabasco and Vera Cruz. This spreads out and stretches northward to the vast plateau of Anahuac, 4,000 to 8,000 feet high, where the oceanic relations are reversed, the Atlantic side being precipitous and the Pacific terraced. There is no single range corresponding to the The so-called Andes or Northern Rockies. cordilleras are merely the outer escarpments of the plateau, though often far above its mean level. Loftrest of these is the Sierra Madre

of the Pacific, traceable at a mean elevation of over 10,000 feet from Oaxaca to the United It skirts the western coast within from 60 to 70 miles of the entrance to the Gulf of California Thence onward a far wider coast land has silted up Along the Gulf of Mexico are the correspondent cordilleras of Tamaulipas and Nucvo Leon, 6,000 feet in mean elevation. The southern central plateau maintains its height of 7,000 to 8,000 feet with great persistency to within 40 miles or less of the Atlantic Through Lower California is a similar ridge some 3,000 feet high. The plateau is not a level surface Railroad elevation north from the capital varies by 4,500 feet, declining northward; while the centre is intersected by short secondary ridges and valleys, mostly with the north-northwest trend. Most important of these is the Anahuac cordillera, surrounding the valleys of Mexico and Puebla; its culminating point is the Nevado de Toluca ("snow peak"), 15,163 feet But across this, and generally confounded with it, is a newer transverse ridge from ocean to ocean, traced by five active or recently quiescent volcanoes and several extinct cones, among which are Popocatépetl, 17,882 feet, and Ixtaccíhuatl, 17,338 feet, in the centre, southeast of Mexico City, and Orizaba, eastward bordering Vera Cruz state, 18,696 feet On the Pacific side is Colima (volcano), 12,989 feet; and the line runs out to the Revillagigedo volcanic islands. runs out to the Revillagigedo volcanic islands. The sierras of Guerrero, Oaxaca and Chiapas are nearly parallel to this. The other high mountain peaks of the republic are the Malinche, between the state of Tlaxcala and Puebla, 14,643 feet; the Coffre de Perote, Vera Cruz, 14,042; Ajusco, in the southern part of the Valley of Mexico, 13,075; Tancitaro, 12,661, and Petamban, 12,300, in Michoacán; Derrumbadas, 11,801, Ocelazin, 11,480, and Peñal, 10,744, in Puebla; Cempoaltepec, 11,139, Oaxaca; Lanitos, 11,021, Guanjuato; Tzirate, 11,022, Michoacán; Zumate, 10,994, and Nava-11,022, Michoacán; Zumate, 10,994, and Navajas, 10,289, Hidalgo; and Laurel, 10,138, Aguas-calientes. The mountains of Mexico are exceptionally picturesque and interesting, affording innumerable views beautiful in the extreme.

Rivers.— Mexico possesses comparatively few rivers, and of these few are large and deep enough to be of commercial importance. Many of those marked on the map of the republic are either wholly or practically dry a part of each year. This is especially true of the northern half of the country. The most important rivers are the Rio Grande (Bravo del Norte), which forms the northern boundary line of the republic for 1,097 miles; the Pánuco, which rises in the mountains of the state of Mexico and empties into the Gulf of Mexico at Tampico, after a course of 360 miles, the Papaloapan, the source of which is in the mountains of Oaxaca and which crosses the state of Vera Cruz, emptying into the Gulf of Mexico at Alvarado; the Coatzacoalcos, which also has its source in the state of Oaxaca, and crosses the state of Vera Cruz, emptying into the gulf at Coatzacoalcos, its length being 186 miles; the Grijalva, which rises in Guatemala and crosses the states of Chiapas and Tabasco, to the Gulf of Mexico, 277 miles away from its source; the Usumacinta, which also has its source in Guatemala, crossing the Mexican state of Tabasco

and emptying into the gulf a short distance south of Frontera, its length being 450 miles Official reports state this to be "the most navi-

gable river in Mexico»

The Tuxpan River, which has its source in the state of Hidalgo, crosses Puebla and Vera Cruz and empties into the gulf at Tuxpan. It is navigable for small boats. The Letina, 457 miles in length, which rises in the mountains of Tenango, in the state of Mexico, crosses Jalisco and Tepic and empties into the Pacific at San Blas. The Balsas, 428 miles long, the source of which is in Puebla and which crosses Mexico, Morelos, Gueriero and Michoacáu, empties into the Pacific at Zacatula, in the latter state. The Yaqui, 391 miles long, which rises in the Tarahumari Mountains, in the state of Sonora, empties into the Gulf of California a short distance below Guaymas. The Fuerte, 335 miles long, which rises in the state of Chihuahua, crosses the state of Smaloa and empties into the Gulf of California. Other rivers are the San Pedro, 298 miles; Nazas,

279, Utes, 200, and Smaloa, 200 Lakes and Lagoons. The principal lakes of Mexico, none of which are large, are Chapala, in Jalisco, a beautiful body of water some 51 miles long and 18 miles wide, the shores of which have become a favorite summer resort for wealthy residents of Mexico City, Guada lajara and other parts of the republic, Pátzcuaro (m Michoacán), around which there clusters a wealth of historic, artistic and poetic interest, Curtzeo, in the same state; Chalco, Xochimileo and Texcoco, in the Federal District and state of Mexico, Tepancuapan, in Chiapas; Tequesquitongo, Coatelolco and Hueyapan, in Morelos; Catemaco, in Vera Cruz; Caivel and Carpintero, in Tamaulipas, Encantado, in Tabasco; Bacular, in Yucatán; and Uriria, in Guanajuato. The principal lagoons are the Terminos, in Jalisco and Michoacán; Tamiahua, in Vera Cruz, Madre in Tamaulipas; Mezcalittlan, in Tepic, Coyutlán, in Colima; Tecpan and Coyuya, in Guerrero; Superior and Inferior in Oaxaca; Paras, Coyote and Agua Verde, in Coahula; Guzmán, Jaco, Patos and Santa María in Chihuahua; Xaltocán, San Christólal, Zumpango, and Lema, in cán, San Christóbal, Zumpango and Lerma in the state of Mexico; Mezitilán and Apan, in Hidalgo, and Santa Ana, in Tabasco There are numerous other smaller lakes and lagoons in the republic, which are of much local importance, but which do not appear on the ordinary maps.

Valleys.— The principal valleys of the republic are those of Toluca, Mexico, Cuernavaca, Puebla, Oaxaca, San Francisco and Orizaba, all of which are extremely rich in soil and most favorably situated as to climate and other conditions affecting their products, which include very nearly every article grown in other

parts of the American continent.

Climate.— The chief natural glory of Mexico is its climate, which, though not as invigorating as that of some other countries, is one of the most delightful in the world. In tew localities is there ever intense cold or intolerable heat. It is seldom that death results from freezing, and sunstroke is practically unknown. In the tierra caliente or hot country, the temperature varies from 77° to 82° Fahr., in the shade, while on the central plateau, which includes the capital city, it is much cooler in

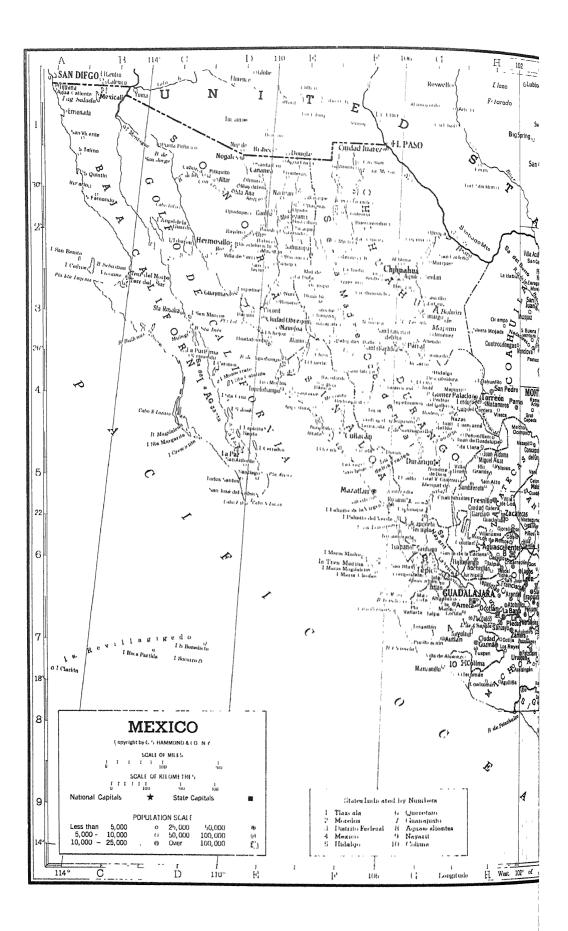
summer and warmer in winter than in the United States In Mexico City the maximum United States. In Mexico City the maximum summer temperature in the shade is 85°, and winter temperature 72°, in Puebla, 84° and 75°, in Oaxaca, 94° and 83°, in Jalapa, 89° and 87°, in Querétato, 90° and 80°, in Guanapuato, 91° and 82°, in Pachuca, 80° and 77°; in Saltillo, "89 and 70°, in Mérida, 103° and 92°, in Mazatlan 91° and 84°. The average each temperature in Mexico City from line to night temperature in Mexico City from June to October is about 55°. The warmest months of the year in that city are April and May, the last two months preceding the beginning of the ramy season, which there extends from June to November. In the regions near the gulfs and the Pacific Ocean, the jams are much heavier and more frequent, and begin earlier and end The average ramfall on the coasts is 44 inches and on the table lands 24 inches. In Mexico there are but two seasons - the rainy, or summer, and the dry, or winter. The temperatures of the spring and autumn months differ very slightly, and the seasons merge into each other quite imperceptibly. The nights are always cool, except in the hot country, where they are seldom uncomfortable, the gull and Pacific breezes compensating for the heat of the day. There are no radical or sudden changes of temperature, no prolonged term of heat or cold or storm, and on the table-lands all seasons are so nearly alike that most persons wear clothing of the same weight all the year Except in the northern states, artificial heat is seldom proyided, either in homes or places of business, even in mid winter.

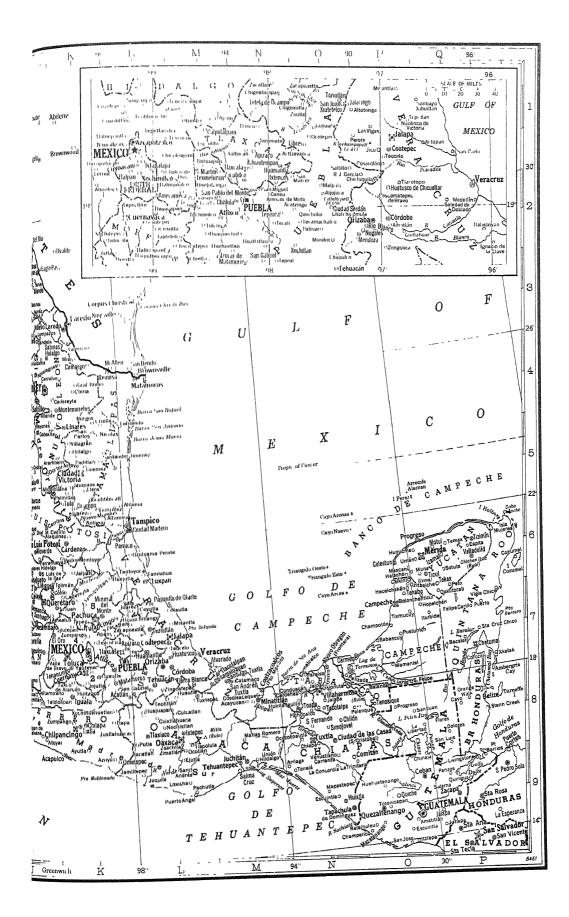
In few other countries is to be found such diversity of climate as in Mexico, whose west coast extends across 18 parallels of latitude, and where the altitudes of the towns and cities range all the way from 20 feet above the sea at Vera Cruz, to 8,700 at Toluca, each plateau or step in the ascent illustrating in its fruits, toliage and flowers the influence of every climate plase and condition. The white peaks of Orizaba, Popocatepett and Istaccifinath look down upon a broad panorama of indescribable beauty to be seen only in this land of perpetual spring. The summer rains on the upper plateaus intensity the green of the verdure, increase the number and beauty of the flowers, develop the fruits, sweeten the atmosphere, and drive away disease. The sun's rays, being always perpendicular, in the middle of the day are very intense. In the shade, however, it is

never uncomfortable

Flora and Fauna. The physical conformation of Mexico is most favorable to the development of a wonderfully rich and varied economic flora. In the hot lands or coast regions, from the sea-level to an altitude of 1,500 or 2,000 feet, cocoannits, cacao, vanilla, peppers, nutniegs, ginger, cloves and other spices and all the fruits of tropical countries are successfully and profitably grown; while sugar cane, coffee, rice, cotton, tobacco, hemp, oranges, lemons, limes, bananas, mangoes, apples, peaches, papayas, pears, plums, figs, cherries, grapes, zapotes, pincapples, mameys, pomegranates, yams, sweet potatoes, Irish potatoes, most of the edible roots, and in fact about all the varieties of fruits and vegetables grown anywhere are found and successfully cultivated in altitudes up to and including the valley of Mexico, 7,500 feet above the sea. Wheat, corn

MEXICO							
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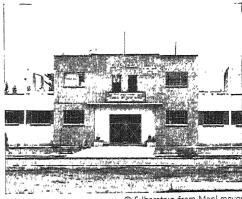


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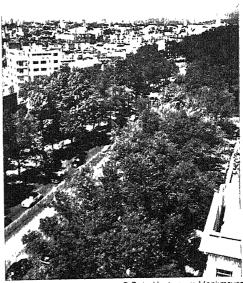
(c) Ewing Gall
The Castle -ruins of Chichen-Itza, Yucatan



© Silberstein from Monkmeyer Modern Mexican school in suburb of Mexico City



Courtesy Mexican Government Railway System
Pyramid of the Sun, near Mexico City



© Fritz Henle from Monkmeyer Paseo de la Reforma, Muxico City.



The observatory at the Chichen-Itza ruins.



Front of the Cardiac Institute in Mexico City



View of canal from bridge, Xochimilco.

a. The Watern from Condress, N. Y. View of stairs of Temple of Quetzalcoatl, San Juan, Teotihuacan



(c) Gendreau

The Cathedral of Mexico City is the finest and largest in Mexico.

and most of the grains of commerce produce nops in some of the states, twice or three times in a year notably in Vera Ciuz, Tabasco, Chapas, Oaxaca, Guerrero, Michoacain, Jalisco, Mexico, hifty-two species of cereals and vegetables, 87 of fruits, 100 of odoriterous flowers, 50 of building woods, 21 of cabinet woods, 8 of guins, 3 of resins, 12 of forages and 113 of medicinal plants, reach a high degree of perfection in Mexico Flowers of almost innumerable varieties, from the gorgeous orchid of quaint and curious form and wonderful combination of colors, to the modest daisy, violet and tuberose, grow wild, in extravagant profusion, all the year round, the range of altitudes meeting the requirements of all the members of the floral kingdom. The flower markets of Mexico City, which are chiefly supplied from the chinampas (gardens in the bed of the half drained lakes of the neighborhood), are among the objects of interest most enjoyed by the visiting tourist, and they testify to the beauty and brilliancy of the Mexican flora. This country has been deservedly named "the land of flowers," for everywhere and all the year there are flowers of every hue and color. In the forests of the republe, especially in the tropical lands, are found many varieties of trees the tumber of which possesses great value for building or cabinet purposes. Pine of several varieties, balsam, lignum vitæ, Spanish cedar, mahogany, oak, rosewood, mesquite, olive, palm, almond, fit, sesame, cedat, camphor, india rubber, copal, cacao, 12 species of dye woods and numerous varieties of oilbearing trees are among the varied products of the country, the arboreal vegetation of which embraces 114 different species of woods. Included in the fauna of Mexico are the American lion (puma), jaguar, ocelot, wildcat, wolf, coyote, bear, wild boar, sloth, monkey, hare, rabbit, squirrel, armadillo, deer, beaver, otter, mole, marten, and the turtle, which are principally found in the sparsely settled mountains and in the forests of the tierra caliente. None of these are much hunted, the inhabitants of the country having little or no taste for this kind of sport. In the tropics there are many varieties of rich plumaged birds, and song birds are found in all altitudes. Pairots and parakeets abound in the coast regions and are highly prized for their talking qualities and brilliant colors of green, yellow and red. Among the many species of song birds are the zenzontla or mocking bird, the clarin and the mightingale. The birds of prey include the eagle, hawk, turkey buzzard and owl. The cotorra, talking loro, humming bird, sparrow, blackbird, turtle dove, woodpecker, swallow, magpie, heron, falcon, kite and great numbers of others, which inhabit the forests or fields where there is abundance of insect and other food for their sustenance, are found in Mexico. In all localities where there are fresh-water lakes, lagoons, ponds or rivers there are great numbers of wild ducks and geese, and in the forests the wild turkey abounds. Wild bees are numerous, and the Indians derive quite an Wild bees income from securing their honey and marketing it in the cities and towns. Of domestic or barnyard fowls the number and variety are very extensive, and their consumption is enormous. The waters of the Mexican gulfs, lakes and rivers are well stocked with many varieties

of fish of excellent quality, the most prized being the red snapper. The markets of Vera Cruz, Tampico and other coast cities daily display a tempting supply and variety from the gulls, the Pacific and the accessible rivers, and large quantities are shipped to inland points by railway, in refrigerator cars. In the immediate vicinity of Tampico many tarpon of large size are caught. Of reptiles there are many varieties, both venomous and harmless, especially in the southern forests. In the first named class are included coral snakes and rattlesnakes. There are many varieties of scorpions, tarantulas and lizards, some of the latter being so large as to be utilized by the natives as an article of food. To the latter class belongs the iguana which often measures over five feet in length.

2. MINERALS AND MINERAL PRO-DUCTION. For three centuries Mexico was the greatest of silver producing countries; from the single camp of Guanajuato came one-fifth of the silver mined during that period, and for one straight century the same camp gave to the world two-fifths of its silver Yet to-day, after almost 400 years of exploitation, Guanajuato has still uncounted unexploited Yet Guanajuato is but one of many wealth. great Mexican mining camps, known to the world for centuries Whether the natives of Mexico prior to the Conquest formally worked gold, silver and copper mines is an open ques-tion, but that they did exploit the placer deposits of the rivers of the country there is no doubt. Placer gold in quills passed as currency in Mexico at the time of the discovery and for years afterward Gold, silver and copper ornaments, idols and other figures beautifully and often elaborately worked, existed in vast quantities at the time of the fall of the capital of the Aztecs. Since then, throughout four centuries, examples of the metal work of the natives of Mexico and Central America have frequently come to light; and still to-day explorers find these eloquent witnesses of the culture of the Indian empires of America in the graves of their nobles and princes and the ruins of their great cities

Spanish Colonial Period.—With the fall of the capital of the Aztecs in 1521 there began a period of wonderful mining activity throughout the vast extent of the empire of the Montezumas. From the time of their landing on the shores of Mexico near the side of modern Vera Cruz in 1519, until the conquest of the city of Tenochtitlán two years later, Cortés and his followers were inspired by a dream of great wealth to be amassed from the treasure of the emperor of the Aztecs This dream was made more vivid by the presents in gold with which the unfortunate Indian ruler sought to bribe his unwelcome guests to leave the country. After the fall of the city the Spanish adventurers awoke to find their dream of sudden wealth unrealized in so far as the capital of the Aztecs was concerned But they lived in an age when strange fantasy colored the lives of men. If the much-desired El Dorado was not in Mexico City, then it was somewhere else; and the hunt for the golden treasure was continued Thousands of buscones (prospectors) radiated in all directions from the capital in search of the hidden treasure. In this hunt mines of fabulous richness were discovered and towns sprang up

like mushrooms in the almost inaccessible fastnesses of the mountains. By 1537, when the first official report of the vice-regal povernment was made, the mining industry had become firmly established in many parts of the colony and was already paying important contributions into the treasury of the Spanish court. From the establishment, in 1535, of a settled government under the direct representative of the Crown, this mining activity increased with great rapidity and continued to extend itself farther and faither from the capital, the centre of colonial life in New Spain, and the dream of finding El Dorado was never altogether dissipated during the 300 years of Spanish tule in New Spain While the glitter of gold was always before the eyes of every buscon the soft, white gleam of silver brought unexpected wealth to thousands who often squandered their newly-acquired fortunes in the search for the clusive yellow metal. How great was this treasure of silver wealth that Spain extracted from the ringged sierras of Mexico may be gleaned from a study of the report of the government mint. From 1537, when the newly-established royal mint issued its first statement of mining activity, to 1821, when Spain withdrew from the colony, the recorded silver production of the mines of Mexico amounted to \$2,082,260,657. During the same period the gold output was only \$68,778,-411, or less than one-thritieth of the silver returns. Large as these returns are, it must be remembered that probably not more than half the ore mined was ever reported to the government because of the excessively heavy taxes exacted by the Crown, which claimed as its right the royal one-fifth, and frequently, under one pretext or another, succeeded in extorting more from the mine owners. Quicksilver and powder, the most important aids of the miner in Spanish colonial days, were royal monopolies and consequently were sold in Mexico at from three to five times their market values. These and certain local, city and port exactions mulcted the miner of at least another fifth of the output of his mines. Transportation of one from remote interior points, over almost impassable mountain trails, occupied from weeks to months in transit between the mines and the capital or the nearest port Provisions and mining supplies had to be brought to the camp in the same slow and costly manner. All these extraordinary expenses made it possible for the miner to work only the richest ore and forced him to leave untouched veins which, in modern times, have become sensational ore-producers. It forced him also to sort out the richest of his rich ores and to leave the poorer on the dump heap. These dump heaps, worked over by modern mining methods, have produced millions to foreign investors.

During the Spanish colonial period Mexico was literally the silver treasure-house of the world; and most of this wealth went to Spain; and it all, whether it went to the Crown or to Spanish adventurers and capitalists, contributed to make Spain the richest country in the world, thus shaping her destiny and making of her people a nation of adventurers seeking fortune in the vast colonial possessions covering the greater part of two continents, and disdaining the industries, trade and commerce With her yast wealth Spain purchased from the rising

industrial countries of those days, the Netherlands and England, what she required at home; and the mines of the colonies paid for it ail. As a natural result, the national life of Spain was disrupted and the industries languished where wealth came so easily, and she taught the colonies to view life from her own point of view. Mining and the manipulation of vast estates became almost the only occupation of a gentleman. So, from year to year, from every mining centre in Mexico and the other Spanish American colonies, buscones were sent out constantly in increasing numbers to look for new Men pawned then all to go on the same quest Every decade witnessed its rush from one promising mining district to another Taxeo, Guerrero, was opened as a mining camp in 1522, the year after the fall of Mexico City; and from there numerous mining expeditions were sent torth to seek tor new centres of wealth. One of these reached the far-distant state of Chihuahua in 1544. The discovery of Parral, Santa Barbara and other rich mines, caused a rush of miners from the centre and south of the country toward the north and west In 1546 Zacatecas became the centre of this mining excitement, which began to shift, in another two years, to Guanajnato In Le same year the Bolanos mines of Jalisco began to attract attention and other centres of rich mineral deposits were discovered in Zacatecas The following year Hidalgo came into notice through the sensational discoveries of ore at Real del Monte. All these mining districts are still producing ore with no signs of exhaustion and most of them are admittedly but partially exploited. In 1552 Durango was invaded and, three years later, the discovery of bonanza ore in the Sombierete mines brought the state of Zacateeas into the galaxy of shining silver stars. In 1574 Charcas, San Luis Potosi, opened silver mines destined to make the state famous. About the close of the 16th century, the chief mining interests of Mexico centred about Mapini, Durango, which promised to become a great gold and silver producer. Scores of other more or less important mines were opened in the following years, among the most noted being Guadalcázar, Sau Luis Potosí, 1622; Bato-pilas, Chihuahua, 1632; Candela 10, Chihuahua, 1638; Sauta Eulalia, Chihuahua, 1700; El Caballo and other mines in the same state, 1703; the famous Magdalena district, Sonora, 1725 Talapujahua, Michoacán, 1740; a new Real del Monte district, 1759; the Valencia, Guanajuato, 1700; Catorce, San Luís Potosí, 1773 and La Purísima in the same state, 1780. All the dis-tricts mentioned were wonderful producers. The Mapini mines, in Spanish times, made numerous owners wealthy, and since the establishment of the republic German capitalists have made of them one of the greatest gold and silver producing centres of the republic. The Batopilas mines have made the state of Chihuahua famous and attracted foreign capital to themselves and to neighboring mines. recorded output of the Candelario mine for 100 years was \$35,000,000, but so notorious was the avoidance of the payment of the government taxes, that the amount was undoubtedly very much more. At the beginning of the 18th century El Caballo claimed to be the richest mining district in the world. In 55 years its recorded output was over \$85,000,000. The

Parral district, famous in Spanish colonial days for its wonderful tichness, has, in modern times, under English, American, German and other foreign management, justified its reputation as one of the most extensive and generally mineralized districts in Mexico. The Real del Monte, which also produced wealth in Spanish hands, its output in one year being \$15,000,000, has since, under English capitalists, extended its field of operations and has made itself known wherever silver is bought and sold. But the greatest single silver mine in the world is the Valencia, which paid to the government from 1760 to 1826 taxes on \$226,000,000 It probably produced over \$5,000,000 a year for 60 consecutive years. Vast sums of English and American capital invested in this district have done much to develop it along modern lines and to make it known. In the one year 1713 it is recorded as producing \$14,000,000, and so much ore did it yield for a number of years that it made all its owners immensely wealthy. The Talpujahua mine in eight years yielded \$18,000,000. The 17th century was one of development for Spanish miners in Mexico and the 18th one of wonderful production. Toward the close of this latter century the recorded yearly output of the mines of Mexico was \$27,000,000.

The Revolutionary Period.—This, beginning in 1810 and continuing till 1821, disrupted all the affairs of the colony. Mining suffered so severely that it did not recover completely for nearly half a century after the Spaniards had left the country. In 1821 the output of the mines of Mexico had dropped to less than

\$5,000,000 a year.

From Iturbide to Diaz.—Mexico, under the administration of the emperor Iturbide, through the national congress in 1823, favored the development of the mming interests of the country. It abolished most of the exactions imposed upon immers during the 300 years of Spanish rule, and passed mining laws allowing foreigners to enter the mining business in Mexico. Notwithstanding the unsettled state of the country, the inducements offered to foreign capital were so great that vast sums of English money poured into the country for investment in mining enterprises. This was the beginning of that great English influence which remained paramount in Mexican mining affairs until the beginning of the Díaz régime in 1876. During this period the records of the mints show silver \$797,055,080; gold \$47,327,383 and copper \$5,227,855. Since then copper has become one of the largest and most important products of the republic. After the departure of the Spaniards from the country few people in Mexico were possessed of sufficient capital and knowledge to work the mines abandoned during the revolution, many of which had reached depths requiring powerful pumping and other machinery and exploitation on an ex-tensive scale to make the business pay. The English were quick to see the opportunity thus presented; and many companies were formed to acquire and work these old mines and to exploit new ones. In six years (1822-28) six powerful English companies, with a combination capital of 3,000,000 pounds sterling, entered the Mexican field. Among these companies were: The United Mexican Mines Association owning mines in many states of Mexico. ciation, owning mines in many states of Mexico;

the Anglo-Mexican Company, which also acquired many mines; and the Real del Monte Company These English companies did what the Spaniards had never been able to do. They transported powerful modern pumping and other machinery over apparently insurmountable sierras and made it possible to work the rich ore below the water level of vice-regal days. They thus practically created new mines. Among these British investments are included most of the famous mines of those days; Valencia, Mellado, Villalpando, La Luz, Char-cas, Catorce, Fresnillo, San Ildefonso, San Dimas, San Francisco, Guanaceví, Parral, Santa Eulalia, Batopilas, Real del Monte, Santa Gertrudis Blanco, El Oro, Temascaltepec, Bolaños, Tezhuitlan (famous copper district), Taxco and Real del Castillo

From Díaz to Avila Camacho.—From 1857 to 1883 the control of the Mexican mining laws was in the hands of the officials of the state governments This did a great deal of harm to mining interests, created confusion and laid the door wide open for grafting So in 1883 the Federal government was forced to assume charge of the direction of all mining affairs. At the same time a commission was appointed to consider the mining situation and to reform the mining laws, which it did in such a liberal spirit that mining again took a fresh and vigorous start Porfirio Díaz began his administration in 1876 with a broad view of the necessities of his country. He extended the hand of welcome to capitalists of all nations who might help him to realize his dream of a greater and more prosperous Mexico When Diaz returned to power in 1884 after González' four years of office, he continued vigorously the policy of encouraging the mining interests of the country, which during his first term of the presidency (1876-80) had reached the value of \$103,000,000 gold and silver, with the additional potential energy of hundreds of new mining claims registered, properties opened up and many abandoned mines put into operation once more. About this time American, German and French capitalists appeared upon the scene and began to compete vigorously with English investors for a share in the Mexican mining business. By 1884 this competition had already become strong, and from then on it grew in intensity until, in 1913, when the revolution practically halted mining throughout the republic, it had assumed large proportions. Of the newcomers the Americans were the most aggressive. In 1884 Edwin Ludlow, representing American capitalists, began boring for coal in Mexico; and five years later the great coal deposits of Coahuila, at Sabinas and other points, were in full operation. In the 10 years following 1895 over 6,000,000 tons of coal were mined in Mexico, and by 1910 the output had reached 1,500,-000 a year. The discovery and exploitation of coal in the republic gave great impetus to mining and other industries Between 1885 and 1910 Lower California, Michoacán, Coahuila. Sonora and Puebla became great copperproducing states and as such attracted large sums of foreign capital, American and French; and the production of copper rose from 11,620 tons in 1895 to 55,000 tons in 1905. Owing to the slump in the price of this metal, this increase was not kept up during the next five years. Copper and petroleum and its products were, however, the only mining interests that continued active throughout the revolution.

Mining, for a long time, has been the most highly developed and best organized industry in Mexico. It accounts for a large percentage of Mexican exports (75 per cent in 1938) and mining supplies, machinery, etc., constitute an important item in the import trade. Railroad development has been due to mining more than to all other industries combined. Most of the gold mined in Mexico is in connection with silver. There are, however, a number of localities wherein gold is, or has been, the chief value. Such sections include Lower California, Chihuahua, Durango, Michoacán, Puebla, Sma-loa, and Sonora. There are more or less productive mines in all sections of Mexico, except m parts of the Gulf and Pacific coasts. The chief mineral zone extends from the United States border through the state of Chihuahua in an almost straight line to the Isthmus of Tehauntepec, and then bends northeast into Chiapa The average width of this zone is 50 miles, though in places it is much wider. The best known mining districts are near the center of the main zone in Zacatecas, Durango, Querétaro, Mexico (state), and Oaxaca. Lead is widely distributed. Most of it occurs in connection with silver, but there are independent deposits. As a source of lead, Mexico ranks second only to the United States. The copper deposits are enormous. The metal is found in Michelioacáu, Mexico, Guerrero, Lower California, and especially in Sonora Silver, copper, lead and gold, together, account for over 90 per cent of Mexico's exports of metals and metallic ores. In 1939 the estimated production of silver was 75,-800,000 ounces valued at about \$30,000,000 Gold mined in the same year had an estimated value of \$33,000,000, giving Mexico sixth place among the gold-producing countries of the world. Other minerals of importance include zinc, antimony, mercury, arsenic, manganese, iron, graphite, tin and tungsten.

With the discovery of vast deposits of oil in Mexico, many American and British companies obtained concessions for the development of the fields and for some years Mexico ranked second among oil-producing countries. The constitution of 1917 limits very decidedly the rights of foreigners to acquire property in Mexico, and a law of 1925 required corporations owning land in Mexico to become at least 51 per cent Mexican as to stock control, while corporations operating on Mexican soil within 50 miles of the international frontiers, or within 25 miles of the seacoast were required to become 100 per cent Mexican as to stock ownership within three years. The United States insisted that the law was confiscatory Nevertheless, it was put into effect, and early in 1927 Mexico canceled 179 permits to American oil companies operating in that country.

In the period 1925–29 Mexico produced 6.4 per cent of the world output of petroleum. By 1937 this percentage had decreased to 2.5 per cent. In the latter year Mexican petroleum

production figures began to show an unsteadiness: (1937) 46,907,352 barrels; (1938) 38,505,800; (1939) 42,800,000 During 1940 and 1941 production figures showed a further decline, largely because of unsettled conditions resulting from the government expropriation of the properties of dominant foreign oil companies. After

workers demanded better wages and living conditions in the oil fields, the Mexican Labor Board investigated the complaints and recommended that the oil companies pay \$7,200,000 yearly in workers' benefits and permit labor a voice in managing the industry. These recommendations were upheld by the government and the Mexican Supreme Court When the oil companies refused to accept the stipulations of the Labor Board relative to the management of the industry, President Cardenas, on 18 March 1938, expropriated and nationalized the properties of many of the companies. The British government has refused to recognize the power of the Mexican government over the properties of its nationals. President Roosevelt encouraged a settlement by bringing together representatives of the American companies and official representatives of Mexico in an effort to determine the value of the expropriated properties. The Mexican government set aside \$9,000,000 toward final payment in the event an agreement was reached. At least one company (Consolidated Oil) accepted the Mexican terms, and at the close of 1911 was being paid back, partly in oil The Second World War cut Mexico off from Germany and Japan, with which countries barter deals had been arranged, and as a result both production and sales of petroleum suffered Furthermore, the industry was hampered by the lack of storage facilities. Doniestic consumption increased but not enough to relieve the situation to any important degree. The war needs of the United States, it was believed, might bring about a demand for the entire Mexican production.

MEXICAN MINERAL PRODUCTION (KILOS*)

Product	1936	1937	1938
Antimony	7,303,4.23	10.671.072	8,069,800
Arsenic	8,5.03,713	*2,261,252	8,894,000
Bismuth	165,558	1 19,460	186,000
Cadmum .	535,017	554,160	762,000
Copper		46,100,000	41,880,000
Gold	21,2 3 (1935)	26,326	28,739
Graphite		12,417,600	9,611,000
Iton	61,000,000 (1937)	90,000,000	111,000,000
Lead			282,383,000
Mercury	182,959	163,008	293,683
Molybdenum		905,600	806,000
Silver	2,351,100 (1935)	2,633,870	2,520,115
Tin	373,476	100,000	253,368
Tungsten	52,340	32,700	70,000
Zinc		154,000,000	178,200,000

*Kilo equals 2.2046 pounds.

3. AGRICULTURE AND STOCK RAIS-

ING. From the standpoint of the number of people engaged therein, agriculture is the chief industry of Mexico, though it has not kept pace with mining as a teeder to foreign trade. The number of persons engaged in agriculture, including stock raising, however, greatly outnumbers those engaged in all other industries. The industry is mainly on a domestic basis, though a good many agricultural products are exported. The soil, climate and other natural attributes of the country are particularly adapted to agriculture, and one reason that has been assigned for the failure of the people to more thoroughly develop Mexico's agricultural possibilities is the tendency, inherited from their Spanish ancestors, to seek greater rewards from the exploitation of the minerals, especially gold.

The outstanding crop of Mexico is corn, but little is exported, and in fact imports of corn ordinarily exceed the exports thereof. The an-



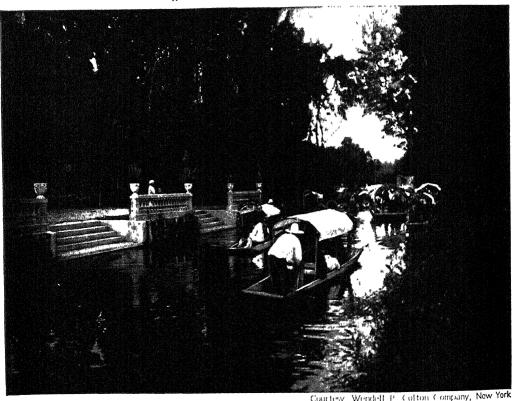
Maguey fields on Toluca Road out of Mexico City-cactus yields sap from which pulque, the national beverage is made



Farm scene on the Pan American Highway, near Victoria in the low country Breaking ground with ox-drawn primitive plows.



Typical Mexican market scene at Tepoztlan.

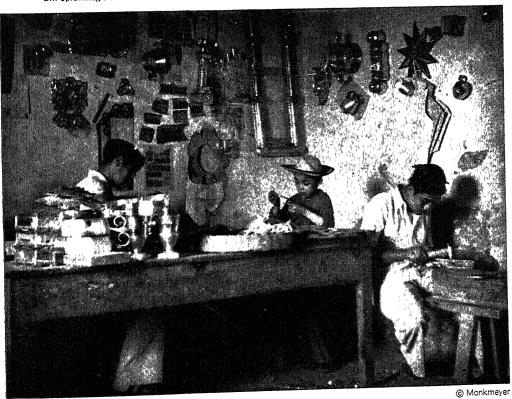


Courtery Wendell P Colton Company, New York Xochimilco, where festival crowds enjoy themselves floating around in flat-bottomed canoes decorated with flowers.



tesy Mexican Government Railway System A Pueblan potter at work

(c) F Honle from Monkmeyer Bill Spialtling's outside silver workshop at Taxco



Interior of Bill Sprattling's silver workshop.



Mexican tiled kitchen.



nual crop averaged 65 million bushels from 1936 to 1938 Com is the base of the food of the Mexican people, and a failure of the coin crop would mean starvation for more than one-half of the population. However, there has never been a failure of the crop. It is said that in some sections of Mexico corn will grow and develop satisfactorily even though no rain may fall during the growing season. The plants may safely depend upon deep lying moistine from winter rains or other hydrologic cause. In certain sections where there is practically no rainfall and where there is very little underground moisture, the crop will grow and thrive upon an almost daily mist or heavy dew, that slightly moistens for an hom or two an inch or more of the top surface. These sections are considered and or semi and, and it is said that no variety of coin grown in the United States will grow in either There are few localities in Mexico it an altitude of less than 9,000 feet where some variety of corn, sintable to the particular section, is not

grown. The cultivation of henequen, sometimes called sisal in the United States, is an important mdustry in the state of Yucatan, and accounts for 20 per cent of the total agricultural exports of Mexico. Nearly all of the henequen crop is exported. An average of 260 million pounds were produced yearly in the three-year period 1936 38 Since 1937 export taxes have retaided the exports of henequen and have stimulated its derivative binder twine. Another export crop is ixtle fiber, the value of which is about one-fith the value of the henequen crop Coffee, next to henequen, is the most important export crop Tomatoes and other vegetables are grown in export quantities. The sugar crop averages about 170,000 metric tons annually. One of the most important of the Mexican food crops is "finioles," the name applied, in a strict sense, to the brown or spotted varieties of beans, known in English-speaking countries as «kidney beans» Next to coin, frijoles constitute the chief vegetable diet of the Mexican people. There are no accurate estimates of the annual crop, but production is supposed to average over 30,000,000 bushels. Only about 2 to 3 per cent of the crop is exported. Another important crop is garbanzos, or chick peas, though they have not the important place in the diet of the Mexicans that corn and frijoles have. Other products of Mexico are vanilla, fresh fruits, sarsaparilla, and peppers. Cantaloupes are also raised in export quantities. The flavor is generally excellent. Rubber and guayule are semi-cultivated. In recent years there has been a falling off in rubber and guayule production. At one time these two commodities accounted for about \$12,000,000 in the value of the country's exports. Mexico is supposed to be very well adapted to the cultivation of rubber, but for some reason effective plantation production of rubber from the castilloa tree, of from the guayule shrub, has never been accomplished. Up to 1927 the cultivation of the Hevea tree had not been tried. In 1938 the total exports of crude rubber did not exceed.

3,000 long tons.

Tobacco cultivation would appear to have excellent possibilities in Mexico. There is in the country an extensive territory suitable for its production, and the flavor of the Mexican cigar leaf is excellent. The crop, however, has never attained a position of great importance in inter-

national trade. Recent improvements have helped to bring the tobacco production up 50 per cent above the 1929 level.

Mexico has within a few years become a leading banana exporter, and in 1938 took the lead among Latin American exporters of bananas. It ranks second, being exceeded only by Jamaica, in world production In 1938 banana exports were valued at 16,913,102 pesos. Large quantities of vegetables such as lettuce and tomatoes also are shipped. All of the citrus finits are grown extensively and apples, peaches and pears are important orchard ciops. Fruit growing for export is becoming yearly a more important part of Mexican commerce. Other agricultural products include the yucca or starch plant, said to contain six times the nutritive value of wheat, chicle from which chewing gum is made, and mangoes.

ESTIMATED PRODUCTION OF MEXICAN CROPS

Barley	70,000	metric tons
Beans	105,000	tons
Chickpeas	55,600	tons
Coin	65,000,000	hushels
Cotton	306,000	bales
Rice	80,000	metric tons
Sugar	330,000	short tons
Wheat	12,500,000	bushels

Land Holdings.—The land problem in Mex-ico is of long standing. In 1910 it was esti-mated that 2 per cent of the population owned over 80 per cent of the land, and that from 80 to 90 per cent of the rural population was land-The problem was made more acute by the fact that only about 6 per cent of the total land in the republic is arable. After various efforts to reform the Agrarian Laws had failed, the unrest finally resulted in the so-called Agrarian Revolution of 1910 and succeeding years. In 1915 President Carranza issued a decree providing, when practical, for the restitution to villages of ejidos (village communal land) illegally alienated in the past and for the expropriation of lands necessary to endow other villages with epidos where such villages were in need of them. The constitution of 1917 not only incorporated substantially the Carranza decree of 1915 but made provision for the return to national ownership of subsoil deposits and limited the acquisition of agricultural property by foreigners. It also provided for the subdivision of the larger landed estates and the distribution thereof in the shape of small farms among the laboring classes In 1923 President Obregón issued a decree opening federal lands to all Mexicans over 18 years of age (including citizens by naturalization) for agricultural purposes. Under this decree one plot only could be assigned to a single individual who was forbidden to sell to a foreigner or to any Mexican owning as much or more acreage. The distribution of irrigable lands was limited to about 64 acres per holding. The distribution of dry lands was limited to about 250 acres per holding and the distribution of pasture land was limited to approximately 1,250 acres per holding. Large areas of public land which had been alienated were re-acquired for the nation and both national and state laws were enacted looking toward the breaking up of the large haciendas. The object of the Obregón decree appears to have been to limit the distribution of re-acquired land among individuals and to do away with the communal holdings. But so far as the Indians were concerned this policy proved impracticable because of the Indian penchant for the communal system. The Obregón idea was abandoned in great part by his successors who reverted to the epido or communal system. Various decrees, the latest being those of 12 and 31 Aug 1937, have dealt with the partition of the land. According to the semiolicial El Nacional (daily newspaper of Mexico City), up to 31 Aug 1937 the total of lands donated was 41,787,455 acres Between 1937 and 1942 over 16,000,000 additional acres were distributed. It appeared, however, that President Avila Camacho would soon put an

end to the program.

Lands held under the *cjido* system may not be sold or mortgaged, and they are financed through the government bank known as the Banco Nacional de Crédito Epdal Technical guidance is also furnished by the government. Farmers who are members of *cpdo* groups draw regular wages from the pooled profits of their communal groups, and the operations of these groups are directed by foremen elected by the farmers themselves. Title of these lands, however, rests in the government. The individual farmer may pass his own particular plot on to his children if he so desires, but failure to work his plot two years in succession is equivalent to forfeiture. During his administration President Avila. Camacho began tuning away from *cpdo* distribution of lands and stepped up the pare of granting workers full ownership of their small farms.

Stock-raising.—The plains of northern Mexico and the valleys of the southern portion offer most favorable opportunity for profitably engaging in the livestock business. The climatic and other conditions are very favorable, the grasses are most nutritious. The transportation rates and facilities are such that cattle can be raised in Mexico and shipped to the markets of the United States at a good profit. An idea of the increase of this industry in Mexico may be gained from the reports by the government of the number of cattle exported annually. These show a regular and very considerable increase in normal times. The Para grass of the southern Mexican states is always green, grows luxuriantly and is very nourishing. It is estimated that an acre of this will feed two head of stock the year round, and that three acres in pasture will fatten four head. Because of the great number of flies and ticks in the low country, very young stock thrives better on the higher plains of Durango, Chihuahua, Michoácan, etc Mexico has an abundance of Michoacan, etc. Mexico has an abundance of sustenance to provide for an enormous increase of her present supply of livestock of every kind. The states of Durango, Sonota, Chihuahua, Nuevo León, Coahuila, Sinaloa, Tamaulipas, Vera Cruz and Michoacán constitute an admirable field for the carrying on of the cattle industry. As far back as 1883, there cannot ever an area of 300,000 square miles. "roamed over an area of 300,000 square miles in the northern part of the country," according to a well-known writer, «1,500,000 cattle, 2,500,000 goats, 1,000,000 sheep, 1,000,000 2,500,000 goats, 1,000,000 sheep, 1,000,000 horses and 500,000 mules, and there were 20,574 cattle ranches in the republic, valued at \$515,-000,000 » Between the cities of Jalapa and Vera Cruz, and between Vera Cruz and Cordoba, great numbers of cattle were to be seen from passing railway trains, their sleek and well-rounded sides testifying to the excellence of the indigenous grasses before the revolution

came to partially destroy an industry that promised to become very much greater in the near luture

Despite the fact that the live stock industry in Mexico has never been developed to anything like the limit of its possibilities, it is nevertheless an important element in Mexican agricultural wealth. The latest estimate of the domestic animals in the country gave the number of horned cattle as 2,364,000, the number of horses as 512,300; the number of mules as 301,000; the number of sases as 288,000; the number of sheep as 1,196,000; the number of goats, 2,100,000, and the number of hogs as 1,000,000. These estimates are almost wholly guesses.

4. COMMERCE. The efforts of the various governments of Mexico since 1876 have been steadily directed toward the encouragement and extension of the commerce and in dustries of the country, external and internal, This has been done in the face of many and great difficulties. At the beginning of the Diaz regime Mexico was overburdened with debt, torn and wasted by revolution and party dissensions Railway and other communications were lacking, and ports, harbors and regular coast and ocean routes, both passenger and traffic, in the modern sense of the term, were non existent. Therefore steady and profitable international relationship had not yet been established. Mexico also lacked the educational knowledge and experience necessary for the building up of these. The third of a century spanning the beginning and the end of the Diaz regime witnessed a complete change in the commercial conditions existing in the republic During this period harbors were constructed to accommodate great ocean going vessels; international relations were extended and broadened; and the industrial, educational and commercial life of the nation quickened into notable activity. But the revolution of 1910 and the fratricidal strife that accompanied it set back the progress of the republic Mexican commerce is peculiarly dependent upon the industrial and agricultural life of the nation because this alone makes possible the purchase of a vast number of foreign products. The disruption of the national life through the revolution vastly decreased the purchasing power of the Mexican people, and this, in its turn, very deeply affected its commercial activity. The almost complete destruction of the cattle business helped to still further intensify this arrested development. Along the old lines of its national life the income of the government declined in sympathy with the anarchical conditions existing throughout the country, to such an alarming extent that the most primary needs of the nation would have been lacking were it not for the fact that a new and important fac-tor made itself felt strongly in the national life and largely supplied the lack in the national income by filling in the gaps caused by the lack of commercial activity throughout the nation. This was the rise to sudden importance of the mineral oil industry during the war years of 1914-18. But the storm and stress period through which the country passed from 1910 to 1919 was significantly reflected in the almost total lack of industrial and commercial statistics relative to the activities of the national life since the fiscal year 1912-13, when official census figures

were issued. This census represented the more or less normal life of the nation, which had been gradually returning to its pre-revolutionary condition throughout the whole extent of its territory.

Due primarily to the increase in mineral production, Mexico's exports more than doubled in value between 1920 and 1930, and its import trade increased as well. The leading countries with which Mexico's foreign trade is carried on are the United States, which takes over 60 per cent of the exports and supplies about 57 per cent of the imports; United Kingdom, which takes about 9.4 per cent of the exports and supplies about 4 per cent of the imports; Germany, which takes from 7 to 8 per cent of the exports and supplies 18 to 19 per cent of the imports; and France, which takes 2.3 per cent of the exports and sends 4 per cent of the imports. Other countries with which Mexico trades are Cuba, Argentina, Belgium, Spain and Netherlands.

The chief imports include meats and fish, wheat, flour, wool and wool manufactures, silk and rayon fabrics, leather, wood for building, furniture, mineral oils, glass, iron and steel, machinery, vegetable oils, chemicals, soaps, perfumery and cosmetics, and tools and implements. The leading general exports include fresh vegetables, especially tomatoes, cattle, fresh and dried truits, coffee, vanilla, raw cotton, henequen, rubber, hides and skins, petroleum, heavy and light, gas oil, fuel oil, gasoline, kerosene, copper, lead, zinc, chiele and silver bullion

Exports during 1938 amounted to \$186,064,000, against \$247,638,000 in 1937, while imports totaled \$109,694,000, as compared with \$170,-317,000 in 1937. The total 1938 trade decreased 29.2 per cent in dollar value from 1937. Imports from the United States during 1938 were estimated at \$63,255,000 (57.7 per cent of the total) and exports to the United States totaled \$125,369,000 (67.4 per cent of the total). Mexican imports from Germany during 1938 were estimated at \$20,580,000, or 18 8 per cent of the total; while exports to Germany valued \$14,309,000, or 7.7 per cent of the total. Imports from Great Britain aggregated \$4,476,000, or 4.1 per cent of the total, and exports to Great Britain valued \$17,550,000, or 9.4 per cent of the total. The estimate of imports from the United States for 1941 was \$102,304,000.

The following table gives the value of general imports and exports in thousands of dollars for years 1930 to 1939:

Year	Imports	Exports
1930	\$165,039	\$216,173
1931	92,352	170,437
1932	57,621	97,046
1933	68,697	102,556 178,316
	92,502	207.831
1935	112,500	215.248
1936 1937	130,767 170,317	247,638
1937	109,694	186,064
1939	101,878	176,489

There is a remarkable average amount of excess exports over imports, and a remarkable average percentage which the excess holds to local trade. There is also a stability and a continuity of the plus balance. It has not been a case of fluctuations—one years' excess offsetting contrary balances of previous years. The condition has been sure and steady. Formerly, about 96.8 per cent of Mexico's oil

resources was owned by foreign countries, chiefly by the United States and Great Britain In March 1938, however, the Mexican government expropriated the entire petroleum industry, valued at approximately \$450,000,000. No exact statistics are available in regard to ownership of the mineral industries, other than oil. There is no doubt, however, that a large proportion

of the total is foreign.

In the upbuilding of the foreign commerce of Mexico, the construction of railways made possible the phenomenal results that have been achieved since 1898. The entire foreign trade of the country, practically, has been created since 1876, most of it since 1880. Before competition in the transportation of freight was provided, the rate from Vera Cruz to Mexico City, 264 miles, ranged around \$68 per ton, going as high as \$330 during the French intervention. Formerly almost all the first-class furniture imported by Mexico came from France, but now much of it is supplied by the United States and some of it is made at home. Most of the importations of agricultural machinery and implements are from the United States. The same is true of food stuffs, lumber, machinery for irrigation works, supplies for mining and for steam and electric railways, unmanufactured leather, vehicles, boots and shoes, canned goods, patent medicines, live stock, cotton, manufactures of steel and iron, sewing machines and typewriters. From Spain and France come most of the wines and cognacs. In normal times Germany and Belgium had, previous to the European War, a monopoly of the hardware trade, England and France of the dry goods trade, and France of the trade in notions, jewelry and fancy goods. Among the leading articles exported by Mexico are coffee, two-thirds of which goes to the United States and the balance to England, Germany and France; vanilla, sugar, tropical fruits, beans, live stock, precious metals, henequen, leaf tobacco, hides, rubber and ixtli.

Mexico has a «commercial code» which dates back to 1887 and which, among other things, provides that foreigners shall be free to engage in commerce, subject to the same conditions and requirements that apply to citizens; that all documents referring to matters of public concern shall be recorded in a public register; that all business correspondence shall be preserved; that notice by circular or through the press shall be given of the character of any business about to be established and of any modifications or other changes subsequently made; that at least three account books,-a general day book, a book of inventories and balances and a ledger,—shall be kept in the Spanish language; that all brokers must be Mexicans by birth or naturalization, have a mercantile education and possess a diploma from the Minister of Fomento or other proper officer; that an unlawful agreement or contract involves no cause of action at law; that mercantile companies may consist either of a partnership under a collective name or with special partners, or may be an anonymous (stock) company, a society with special partners or a co-operative society; that all contracts for the formation of companies must be in writing and very full and explicit; that the consolidation of companies cannot take effect until two months after publication of particulars, except

on payment of all debts; that foreign companies must register in Mexico and publish an annual balance sheet, that there may be "temporary" or "profit-sharing" mercantile associations, the first being without a firm name and making partners jointly hable to third persons, and the last named implying an association under which two or more persons may become interested in operations which one or more may undertake in their own names, but which involve only one legal entity and no responsibility on the part of a partner not joining in a contract with a third party; that the principal of any manufacturing or commercial business shall be responsible for the acts of his managers or employees; that no institution of credit can be established except by authorization of the Minister of Finance and the approval of Congress, that every merchant ceasing to make his payments, whose liabilities are more than 25 per cent in excess of his assets, who has made formal assignment of his goods, or who has absented himself without leaving any person in charge of his business who can pay his debts as they become due, shall be considered a banki not.

Minerals account for a little more than onethird of Mexico's export trade and mining machinery, tools, and mining supplies of all kinds make up a large proportion of the import trade. Silver, copper, lead and gold together constitute more than 90 per cent of Mexico's exportation of metals and metallic ores. Silver represents about one-half the total. Lead comes next as an article of export. Before 1930 petroleum was probably the most important of all Mexico's mineral exports, but the discovery of petroleum deposits in Venezuela, Russia, and Persia and the expropriation of foreign owned properties caused a decline in its value as an export Comprehensive agreements between the American and Mexican governments (November 1941) have afforded aid to mining interests by assuring the purchase of large amounts of silver. The peso will probably be held for the time being at its 1941 value level.

5. MANUFACTURES. Mexico is a manufacturing country in the very primitive sense of the word; for literally the greater part of her manufactured products are made either wholly by hand, by individual tradesmen each working on his own account, or in small shops where the machinery used is employed simply to aid the cuming of the hand. The field for manufactures of all kinds is most promising, since it offers raw material in great abundance, efficient, intelligent labor and a very considerable home market, with a still larger one in Central and South America.

Manual training has been introduced into the schools of Mexico and several arts and trades colleges are turning out skilled mechanics in all lines of industrial work. Wages are low, much lower even than in Europe, and the native workman in the factories already established throughout the country gives his employer little.

or no trouble.

Cotton.—The cotton production in 1929 was 112,541,000 pounds. There were 542 mills employing 39,041 workers on more than 30,000 looms. A few years previously there were 148 cotton mills in the republic. Of these the largest and most modern were in Puebla, Orizaba

and Mexico City. In these factories 32,000 workmen were employed to operate 62,000 spindles and 28,000 looms. The cotton goods they produced during the year were valued at over \$50,000,000, and included sheetings, tickings, lining, drills, shirtings, percales, quilts, napkins, table-cloths, woolen-cotton goods, kintted garments and fleecelined underwear. The Athixo cotton factory, Puebla, employed, in the same year, about 2,000 hands and is capitalized at \$6,000,000; the Compañía Industrial de Orizaba owned four cotton mills, had 4,000 looms and 10 printing machines in commission, was capitalized at \$15,000,000 and employed 6,000 mill hands. The San Antomo Abad, with an invested capital of \$3,500,000, also operated four mills, three in the state of Mexico and one in Mexico City. El Porvenir y Anexas, at Villa Santiago, Nievo León, was capitalized at \$2,000,000, and the Veraciuzana, of Santa Rosa, in the state of Vera Ciuz, near Otizaba, at \$3,500,000.

There are a number of Woolen Goods. woolen lactories in Mexico; but they are of less importance than the cotton mills, for the reason that the great mass of the lower classes wear cotton garments, thus creating a strong, and constant demand for the latter goods. There are woolen mills in Dirrango, Aguascalientes, Guanajuato, Hidalgo and Puebla; but the most important establishment is near Tlalnepantla, in the state of Mexico and not far from the tederal capital. The woolens made in the republic include suitings, kerseymeres, carpets, blankets, rings and knit goods. The city of Saltillo, Coalqula, is noted for its handsoms scrapes (native blankets), for which there is a constantly increasing demand. These scrapes, which are made on primitive Indian looms are exceedingly well woven, of fine texture, brilliant colors and pleasure designs. The San Ildefonso factory at Tlalnepantla, with a capital of one and one half million dollars, is one of the most successful manufacturing enterprises in Mexico and its goods are to be found on sale throughout the republic.

Silk. Few countries have the natural advantages for raising and manufacturing silk possessed by Mexico Throughout the greater part of the republic both white and black mulberries grow fuxurantly and require practically no care even in those regions less favorable to their cultivation. So even is the climate in most parts of the country that silk worms can be grown out of doors practically all the year round; and they require but a small part of the care they must necessarily receive in Italy. Labor in Mexico is cheap and the masses of the people, once accustomed to cocoon raising and the cultivation of the mulberry tree, might be expected to thrive at the business as their ancestors did in all the industries, before Europeans came to disturb the current of their na-tional life. The Indian is industrious when he works on his own account.

In Mexico City there is one important silk factory, which is engaged in manufacturing rebosos, the light shawls which the Mexican women of all classes wear almost universally everywhere outside the larger cities. This factory received strong encouragement from the Mexican government, which has, for some years, been anxious to establish the silk industry on a firm basis in the republic. Two great nurseries near the capital, one at Coyoacan and

the other at Churubusco, began in 1907 the planting of 0,000,000 mulberry trees, from which it was proposed to send out free propagation slips to all parts of the country wherever people could be induced to plant frees and to go into the business of silk raising

Textiles and Fibres. - There is perhaps no industry in Mexico that shows more variety in forms of manufacture than that of fibreplant products Rope, cordage, thread, packing, carpets, rugs and practically every form into which linen, hemp, jute, right, henequen and other native fibre plants and textiles are made, are manufactured in Mexico Among the most important textile and fibre goods factories in the republic are La Aurora of Cuautitlan, near Mexico City, which has an invested capital of \$1,300,000 and turns out bags and packing of all kinds, La Industrial Manufacturera Company, capitalized at \$4,000,000 and operating six factories, the Linera de Mexico Company, capital \$000,000, Santa Gertrudis Company, near Orizaba, capital \$1,000,000, hands employed in normal times from 1,300 to 1,500. All over the republic, wherever the numerous fibreplants grow, which is almost everywhere, on highlands and lowlands alike, the natives carry on the manufacture of tope, cord, string, thread and course wrapping cloth just as their ancestors did before the Conquest These products of the country can be found from the Rio Grande to Guatemala Ixtli (agave rigide). a rather coarse century plant, furnishes a considerable part of the raw material for this industry. The maguey (agave Americana), from which the native pulque is extracted, also supplies raw material for the coarser kinds of tope, cordage and sacking Even mats and tope, cordage and sacking rugs are made from it. In addition to the large and very general consumption of these goods, the exports to foreign countries amount to about \$25,000,000 amually.

Among the other fine fibre plants of Mexico are zapupe and pita, both of which furnish long, silky, strong commercial fibre, which is not exported because the home consumption demands more than the output The best known, commercially, of all the fibres of Mexico is henequen grown in Yucatán and the neighboring states of Campeche and Chiapas, and to a small extent, in other parts of the republic. From the finer fibre of this plant there are manufactured in Mexico many varieties of woven fabric that resemble silk in appearance and softness of texture. In fact there are in Mexico numerous fibre plants that offer more or less acceptable vegetable substitutes for silk. Since time immemorial henequen has been manufactured, in Mexico, into rope and cordage of all kinds, but now it is exported, principally to the United States, for the making of binding twine for reapers. Though no country in the world is richer than Mexico in excellent fibre plants, yet she imports large quantities of linens, hempen fabrics, yarns, laces, handkerchiefs, trimmings, carpets, rugs, curtains, quilts and almost every kind of goods manufactured from the various fibre products, all of which could be made at home from native-grown products at a great saving to the nation. Characteristic products are the huge, highly-adorned, sugar-loaf, native felt sombreros and the so-called Mexican Panama and other straw and reed hats Most of the

latter are made by individuals in their homes. The natives display much taste in this work, which is another of the numerous industries of the country handed down from father to son for hundreds of years. La Abeja (The Bee), in the Federal District, near the capital, with an investment of \$500,000, is the most important of the hat factories of the country. In Mexico, Guadalajara Puebla, Vera Cruz and Oaxaca there are from one to a score or more smaller hat factories, each of which has its own wholesale and retail store. In addition to these there are little shops that do a purely local business.

Beer, Wines and Liquors.—There is a large consumption of distilled and fermented liquois in Mexico, a very considerable percentage of which is made in the country. Within the past 20 years beer has come into favor in the cities and larger towns, and it may be found on sale even in the smaller interior towns and villages. though the consumption in such places is rather slight There are many sugar cane distilleries in the republic, producing 5,506,710 gallons of alcohol and brandy annually. There are several large and well-equipped breweries in Mexico City, Oaxaca, Monterey, Puebla, Vera Cruz, Orizaba, San Luis Potosi and Tampico, while installations of lesser importance exist in several of the smaller cities. In the capital there are several distilleries where whisky, brandies, cognacs and cordials of various kinds are made In the Pairas district of Coahuila and in some other parts of Mexico excellent wines are produced, and wherever sugar is grown which is pietty general in the low, hot lands of the coast country, aguardiente (native rum) and excellent alcohol are manufactured. Many of the sugar plantations possess the most modern plants for making these products. Much of the Mexican aguardiente is shipped to Europe where it is turned into cognac. Tequila, a strong alcoholic liquor somewhat like Holland gin, is manufactured extensively in Mexico, but most of the output is consumed at home, for its use is general throughout the country. Like pulque, tequila is manufactured from the century plant. The use of pulque is more extensive than that of either tequila or aguardiente; but it is confined to the upland plateaux and the country at an elevation of 4,000 feet or more, because there grows the maguey from which it is manufactured On the uplands it has been, for many years, the greatest of the industries of the country, after mining, millions of acres being devoted to the growing of the Another distilled product called mesmaguev cal is made from another and smaller species of the agave; and it is extensively used in the region where this latter plant thrives.

Soap, Candles and Chemical Products.—A great part of the raw materials used in these industries is still imported though the republic is capable of producing most of them. The Laguna Soap Company, capital \$5,000,000, formed by the amalgamation of two large cottonseed-oil companies, produces daily in normal times and conditions, 400 tons of cottonseed oil, 7,500,000 pounds of soap and 2,000 metric tons of glycerine, together with a variety of edible cottonseed-oil products. It employs from 800 to 1,000 men. La Union Soap Factory of Torreon capital \$2,000,000, is engaged principally an the manufacture of soap

and glycerine The company also has a large refining plant near Torreon There are a number of smaller soap and many candle factories scattered throughout the republic Chemicals, paints, varnishes and acids are also manufactured in or near numerous cities and towns A few years ago all the petroleum and petroleum products used in Mexico were imported and sold in the republic at excessively high prices Now petroleum, benzine, kerosene, para ffine wax, asphalt and many by-products are manufactured in the country, and native oil has become an important factor in the national life. Whole railway lines use oil burners on their engines and petroleum is employed for producing motive power in many kinds of industrial life. Yet but a very small percentage of the possible native oil sources has been exploited, for the oil belt extends all the way from Texas to Guatemala on the Gulf side and large deposits are known to exist on the Pacific Coast The refining of crude petroleum has become a business of considerable importance in Mexico and the exploitation of the asphalt deposits has already influenced the pavement of the streets of the cities and larger towns of the republic.

Iron and Steel Products.-No other Mexican industry has grown so fast within the past dozen years as that of the great non and steel foundries now turning out products equal to those of the steel-producing centers of the world. This output includes smaller agricultural implements, marketable from and steel, and a constantly increasing number of finished products such as are turned out from the great American and European steel plants. The Montercy from and Steel Company, capital \$10,000,000, with its great blast furnaces, produces 300 tons of steel per day. It makes steel rails and structural non and steel in vast quantities and of excellent quality Monterey is the most important center of this new industry; and naturally there the business has reached the highest state of perfection in the republic. The steel and iron industries of Richard Honey, in Hidalgo and the Federal District, are next in importance to those of Monterey. Two other important from foundries in Jalisco rely chiefly upon local trade. One of these at Zapalapa supplies iron to Guadalajara, Aguascalientes, Manzauillo and surrounding country.

Guayule.—In Mexico the production of rubber is a real manufacturing industry in certain parts of the republic where the guayule plant grows in abundance. This plant is a low shrub from two to four feet in height from which crude tubber is extracted by means of specially constructed machinery. The plant is torn out by the roots, is crushed and the sap extracted from it. It then undergoes certain processes before it becomes commercial rubber. Several years ago exports of rubber and guayule had a value of \$12,000,000, but since then there has been a falling off in the production of these commodities, though both are semi-cultivated. However, the effective plantation production of rubber from the castilloa tree (castilla clastica), or from the guayule shrub (parthenium argentatum) has never been accomplished in the republic, and the cultivation of the Hevea tree had not even been tried up to a recent date. Mexico would appear to be well adapted to the plantation production of rubber. The difficulty of obtaining

rubber from the Far Fast has increased the demand for Mexican rubber and guayule, and an increased output is anticipated

Tobacco. There are many cigar and cigarette factories in Mexico, but the latter far exceed the former in volume of business. The principal tobacco maintracturing centers are Mexico City, Orizaba, Puebla, Jalapa, Vera Cruz, Cuernavaca, and Guadalajara. But there is scarcely a city or fown in the republic that does not make either cigars of cigarettes or both for local consumption, and each maintracturing district has its own favorite local brands. In the city of Mexico an immense number of cigarettes are made, and there are some companies backed by millions of capital. Certain brands of Mexican cigars are favorably known in Europe and in the United States.

Packing Houses. There are a number of packing houses in Mexico. Several are on the Pacific Coast where the cattle ranges are more or less isolated from the European and American markets, but the National Packing Company, with a capital of \$7,500,000, operating from its headquarters in the capital, is the largest and most important, and does an international business.

Paper. Paper is made by several good mills including the San Ratael and Anexas Company, situated near the capital. Though the output of San Ratael runs to the commoner grades of paper, including large quantities of newspaper print, yet it also makes high grade paper of numerous styles and degrees of fineness, among these being calender and the finer grades of half-tone paper. The removal to Mexico after the Spanish Civil War of numerous publishers of books greatly increased the demand for good grades of paper. Production did not increase proportionately, and consequently prices soared. American markets, because of the war scarcity, were unable to respond adequately to Mexican needs.

Dynamite and Other Explosives.—These including giant powder, are manufactured in Mexico; and the government has its own ammunition factory at Santa Fé, near the capital. The Mexican National Dynamite and Explosives Company, at Dinamita, Dinango, produces over 50,000 pounds of explosives daily.

Flour Mills. Large flour mills, modern in every respect, and others of smaller capacity and more primitive types, are to be found in Mexico from Monterey to Yucatán. Of these the most modern are: El Hermosillense, Hermosillo; the Chilmahua. Flour. Company, Chilmahua; the Goleta Mills, Saltillo and Monterey; the Phoenix Mills, Saltillo; the Esmeralda Mills, Monterey and Ramos Arizpe; the Alliance Mills, Torreón; the Diamond Mills, Gómez. Palacio; the Gulf Flour Company, San Luís Potosí and Mérida; Aurelio Herrera and Company, Irapuato; the Union Mills, Toluca; the National Flour Manufacturing. Company, Mexico. City; the Bakers' Mutual Association, Guadalajara; and La Perla Mills, Aguascalientes.

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6. TRANSPORTATION AND COM-MUNICATION. Before the white man had set foot in Mexico the various nations then occupying what is now the Mexican republic had built many well-paved roads and innumerable mountain trails, in all probability better than the trails of to-day, if we are to judge them by their still existing remains, and by the runs of the great and populous cities whose arteries they were Following the Conquests, and as Spain gradually extended her power over her trans-Atlantic domains and as peace became established upon a firm basis, bringing with it an extension of trade, the necessity for an extensive system of highways between the inland cities and the ports and between city and city became apparent. The Spanish government, ever alive to its own interests, began the construction of the caminos reales, or king's highways, which, a century after the Conquest, had already connected to-gether all the centres of commercial importance in New Spain

Transportation Facilities of the Republic. -Throughout the revolutionary period (1810-21) transportation facilities of every kind in Mexico were neglected, on account of the activity of the revolutionists and the exhausted condition of the Spanish treasury after the Napoleonic wars From 1821 to 1876, the new republic formed upon the ruins of the government of New Spain was so occupied with its own local dissensions that it found little time to give to uphulding of highways and byways of communication. Yet it was toward the close of this period of unrest that the first railway was built in the republic. In 1854 a line connecting Mexico City and Guadalupe, a distance of three miles, had been constructed; and a year later Vera Cruz was connected with Tejeria (12 miles) These were the two extreme ends of a railway by means of which it was proposed to give the capital an all-rail route to the first port of the republic But so slow was the work of construction that it was not until 1873 that this comparatively short line (263 miles) was completed Practically no other railway construction was undertaken in Mexico until after the election of Porfirio Díaz as president in December 1876. In November of the following year, the Secretary of Public Works signed a contract with James Sullivan and his associates for the construction of a railway line from the United States border to Mexico City, and from there to the Pacific Ocean. But Sullivan found difficulty in getting the capital necessary to build the proposed lines. In 1880 a strongly-subsidized concession was granted to the Mexican Central Railway Company, organized in Denver to build a widegauge railway from El Paso to the Mexican capital; and about the same time the Sullivan concession was extended and rearranged so as to empower the holders thereof to construct a narrow-gauge railway from Mexico City to Laredo, on the Texas border Both these lines were eventually built From 1880 to 1898 hundreds of railway concessions were granted by the Mexican government, most of them accompanied with subventions in cash, government bonds and national lands. Such a very active railway era was inaugurated that, in 1890, the government found it necessary to create the new Department of Communications and Public Works, at the head of which was a minister of the Cabinet In 1898 Finance Minister Limantour announced that, in the future, the government would give subventions only to roads of great political and financial importance. In the plan for railway extension laid down by Mr. Limantour at this time were included a road to connect the centre of the republic with some Pacific Coast port, Guaymas or Topolobampo preferred; a line from the interior to Mazatlán; another from the interior to Manzamillo and a fourth to Acapulco. The plan also included lines to connect the capital with Acapulco and Tampico The following year a new general railway law was issued in order to co-ordinate the work of the Minister of Finance and to govern the roads in existence and those being built. The most important railway lines of the country were constructed between 1880 and 1890; after which very little building was done until Mr Limantour took matters in hand in 1898 By 1902 the following roads had been constructed. The Mexican Railway, connecting Mexico City with Vera Cruz; the Mexican Central, from El Pace to the Capital, the Mexican National El Paso to the Capital; the Mexican National, from Laredo to Mexico City; the Sonora Railway, from Nogales to Guaymas; the Interoceanic, from Mexico City to Vera Cruz; the Tehuantepec National, across the Isthmus of Tehuantepec, from Coatzacoalcos (Puerto Mexico) to Salina Cruz; the Mexican Southern, from Puebla to Oaxaca; the United Railways of Yucatán; and the Pan-American, from San Gerónimo, on the Tehuantepec road, to a point in Mexico close to the border of Guatemala. In 1906 the Mexican government succeeded in uniting the two great railway lines, the Mexican National and the Mexican Central, with the "National Railways of Mexico" By 1908 the Mexican International, the Pan-American, the Vera Cruz and Pacific, the Interoceanic and the Tehuantepec National had been brought under the control of the government and in cluded under the foregoing title of the Na-tional Railways of Mexico. During the revolutionary period from 1910 to 1916 the railroads of Mexico suffered very greatly.

At numerous points along the northern border of Mexico its railways connect with railroad lines of the United States. In 1925 the National Railways were placed under the Ministry of Communications, but in 1926 the administration of the several lines was turned

over to the respective companies.

However, by 1937 the main railroad lines of Mexico had been fully nationalized, and there were 14,220 miles in operation. In recent years road building has been pushed as a means of attracting tourist. By 1942 the Mexican link of the Pan American Highway had been completed almost to the border of Guatemala. Other highway routes are Veracruz to Mexico City. (280 miles). Veracruz to San Hipolito (178 miles). Puebla to Mexico City. (80 miles). Acapulco to Mexico City. (281 miles). Mexico City to Guadalajara. (422 miles). Mexico City to Cordoba. (213 miles). Many hundreds of miles of anilines have been developed in Mexico within recent years; and in 1911 over 5,000 miles were in operation.

Postal Service.—The General Bureau of Posts and Telegraphs operates about 765 regular offices, 75 branch offices, 2,160 traveling post offices, 21 postal tranship offices, 1,300 places licensed to sell postage. The federal telegraph and telephone system operates about 820 offices, and 99,950 miles of wire. State systems and private companies operate about 1,024 offices and 10,410 miles of line. Telephones in use number about 140,000. All the railroads of the country disposable are made use of in the postal service, and they are aided in the work by general steamship companies, among them the New York and Cuba Mail Steamship Company (Ward Line), the Mallory Steamship Company, the Panama Railroad Steamship Line, the Compañia Transatlantica, and the United Fruit Company Steamship Service, all giving service between Mexican ports and New York City Steam-ship service between Mexico and San Francisco is afforded by the Pacific Mail Steamship Company and Toyo Kisen Kaisha (Japanese) Between New Orleans and Mexico service is al-forded by the Chyamel Fruit Company, and the Vacarro Line (Standard Fruit and Steamship Company). Other lines visiting Mexican ports include the Compagnie Générale Transatlantique (French Line), the Harrison Line (English), and the Leyland Line (English), and Canadian Marian Parison Line (English), and Canadian Marian Parison Line Constitute the Internation Mexican Pacific Line Coastwise steamship service is supplied by Compania de Navegación del Sureste, and C. Barquin Hermanos y Cia. A wireless station has been installed on the Island of Lobos, off the coast of Tampico.

7. BANKING AND FINANCE. The Mexican people have long shown a capacity for finance. In pre-Columbian days, the financial arrangements of the Aztec Empire were complicated and extensive; and the keeping of the accounts of the tribute rolls was in itself a matter that required more than ordinary executive ability, in an age when the whole income of an empire several times larger than modern Germany, and densely populated, was paid in produce of various kinds. This required vast storehouses in Mexico City and substations for customs receipts in many parts of the land. The Spaniards, too, are keen financiers and the mingling of the two races has produced a blend and a nation which has made great financial advancement during the past quarter of a century. The revolution of 1910 temporatily checked this financial expansion. The first financial establishment in Mexico that may be dignified by the name of bank, was founded, in 1776, in connection with the charitable organ-

ization still known as the Monte de Piedad (National Pawishop). It handled mortgages, issued loans on landed and other property and circulated notes in commercial transactions, for more than 100 years. Several times it was in difficulties, but so great was the aid it lent to the community in general, that it succeeded, cach time, in getting again on its leet. The first real bank organized in Mexico to do business m accordance with modern methods was the Bank of London and Mexico, which was established in the City of Mexico in 1861, with a capital of \$500,000. Its reserve was finally raised to \$30,000,000 shortly before the revolution of 1910, but was reduced to \$10,000,000 in 1913 on account of the insettled condition of the country. Previous to this date, the paper currency in circulation in the country had been issued by certain banks which had been granted concessions to this end. At first the National Bank of Mexico had a monopoly of this right, or claimed to have, but the government disregarding it, gave concessions of a like nature to other federal and state banks. Finally an amicable arrangment was made with the National Bank, whereby it waived the rights in this respect which it had claimed. Then began an era of great prosperity in Mexican banking. Modern methods were introduced in the native institutions and foreign banking houses established important branch houses. These represented capital and institutions from nearly every country in Europe and from the United States and Canada. None of the e foreign banking houses, however, had concessions to issue paper entrency. They formed one of the most powerful factors in the development of the finances and the resources of the country and became the great medium of exchange between Mexico and the outside world

As the Constitutionalist party began their campaign without money or credit, they were forced to issue paper money of many different kinds, which went as low as 1 per cent of its face value. As the military campaign became more extended and intensive more arms and ammunition were needed, and more paper currency was issued. The Madero revolution had been financed with com, for Madero, Ins backers and his family were wealthy; but Carranza was not in this fortunate condition. It was, therefore, after the disappearance of Madelo from the political scene, that the finances of Mexico began literally to go to pieces. Carranza had possession, in the beginning of his career, of only two or three minor ports of entry upon which to depend for any financial assistance from export and import duties. Thus the Constitutionalist party piled up obligations to the extent of 700,000,000 pesos Mexican currency back of which there was no assurance of redemption or any substantial backing of any kind. In addition to this, the country was flooded with the currency of other contending parties and with counterfeits of all paper affoat. Thus the amount of paper currency in circulation in the republic in 1916 when the Carranza government began to come on top will probably never be known. After the recognition of the Carranza provisional government by the United States, considerable attention was paid to the solution of the currency question, which had become of urgent importance. It was finally resolved to make a new issue of

500,000,000 pesos at the rate of 10 cents United States currency for one peso. This value was to be maintained by the sale of gold drafts in New York at the rate specified, in exchange for the new paper. It was to be received, at this rate, for duties, by the government. This was known as the Non-counterfeitable Issue, and was to be issued gradually in payment of salaries and other government expenses at the rate of about 50,000,000 pesos a month. However a very considerable part of the taxes imposed by the tederal government had to be paid in silver These included all export and The greater part of this went import duties to swell the guarantee or reserve fund behind the new paper currency issue. At the same time that this new issue was being put into circulation steps were being taken to retire all the former issues authorized by the Constitutionalist party, whether state or federal. To this end all the bills of 20, 50, 100 pesos were declared (1 June 1916) no longer of compulsory acceptance and the holders thereof were notified to turn them in to the government, upon which they would get receipts promising re-demption in specie, beginning 1 October, at the rate of five cents United States money (10 cents Mexican silver) for the peso. As the market value of this currency was only about two cents and as it had previously fallen as low as one-half a cent, the offer was a very liberal one and had the desired effect. In order to further facilitate the retirement of the old paper currency, all railway and telegraph dues were made payable in it up to 1 Jan 1917 Owing to this clever campaigning on the part of the government, the metal currency, which had gone into hiding shortly after the outbreak of the revolution, began to reappear in 1916, with the increase in confidence in the stability of the Carranza government

As Mexico had no national paper currency previous to the outbreak of the revolution of 1910, the bills in circulation being all bank issue, were kept at par value by a reserve of 50 per cent of the amount in circulation, exacted and guaranteed by law. During the revolution the banks nearly all violated this provision, issuing notes far in excess of their reserve. The Carranza government, after an investigation, gave the offenders a certain time in which to make good the required deposits under pain of being closed. This caused the rapid decline of the value of banknotes throughout the republic, both state and federal. In order to further guarantee the stability of the Non-counterfeitable Issue, \$5,000,000 gold was taken from the national treasury and an additional \$5,000,000 gold was obtained as a loan from the Henequen Regulating Committee of Yucatán; and all bank issues of paper currency were ordered withdrawn from circulation, the government thus retaining, in conformity with the provisions of the constitution, a monopoly of the issuing of all money, whether paper or metal, in the republic (15 Sept. 1916). The income from national lands and forests was also ordered paid in gold; and this too went to back up the new paper issue. Over \$10,000,000 gold was also obtained from uncultivated parts of great estates which had previously paid little or nothing in the way of either federal or state taxes At the same time all the banks in the republic were placed under the strictest government supervi-

sion, and those which had not complied with the conditions laid down as to currency reserve were permitted to do business only through a government interventor, who was empowered to see to their liquidation. None of these banks could issue any specie without the consent of the government. At the same time the duties were divided into four classes, those payable in metal only; those payable in metal or the equivalent thereof in national paper currency of the new issue; those payable in the new paper issue, and those payable in the new Issue or the equivalent thereof in the paper is sues of Vera Cruz and the Constitutionalis. Army The new paper currency issue was distributed as follows. 80,000,000 one peso bills, 60,000,000 two peso bills, 75,000,000 two peso bills, 75,000,000 20 peso bills, 75,000,000 20 peso bills and 75,000,000 100 peso bills and 75,000,000 bills, 75,000,000 50 peso bills and 75,000,000 100 peso bills. This work of reorganization of the currency and finances of the nation was placed in the hands of a commission of five members, all of whom had had considerable experience in monetary matters, and who were required to report to the Treasury Department, under whose direction they were working. Owing to the fact that the revolution of 1910 and succeeding years divided the country into several factions, definite information relative to the financial and other conditions of the country from 1913 to 1919 is not available The finances of Mexico, which were in a deplorably bad condition in 1876, when Gen Porfirio Díaz assumed the presidency for the first time, continued to steadily improve throughout his seven terms of office until, on his re-election for the eighth time in 1910, they had reached such a position that the Mexican government had secured a solid standing in the money markets of the world. The public debt of Mexico, began with a 5 per cent loan of £3,200,000 contracted in England in 1824, which was increased by a like amount at 6 per cent the following year. The interest on these two loans was not paid from 1827 to 1831; and even after this latter date it was met only intermittently and was, therefore, the cause of many disagreeable complications which have become part of the history of the Mexican national debt, which itself became mixed up with political events of primary importance. In 1886 these two first foreign debts of the Mexican nation were consolidated with the national debts Previous to this, dated with the national debts Previous to this, however, they and other loans contracted in 1831 were consolidated into one national debt of £9,247,387, in 1837; and this agreement was again ratified in 1839. In 1846, the whole Mexican foreign debt, including interest due and unpaid, together with certain internal bonds and other unfunded liabilities, were again consolidated into one national debt of £10,241,650 in bonds of the 1846 issue, for the payment of which one-fifth of the custhe payment of which one-fifth of the customs receipts of the ports of Vera Cruz and Tampico, the duty on tobacco in all forms and the silver export duties on ore sent out by way of the Pacific ports were pledged During the war with the United States the American forces seized and retained Vera Cruz and Tampico and the Mexican government was thus unable to meet its foreign obligations. In 1850 another attempt was made to meet the foreign indebtedness of the nation through its conversion into new bonds bearing 3 per cent and

guaranteed by 25 per cent import duties and 5 per cent of the Gulf ports and 75 per cent of the Pacific ports duties, which were to be employed for the payment of interest on the bonds and their redemption. In 1864, by a decree of the imperial government of Maximilian, government stock to the amount of £1,804,800 was issued and was accepted by the original bond holders in payment of arrears of interest The same year the imperial government secured a second loan of £12,365,000 in Paris and London, and this loan was practically all converted into the Mexican Imperial Lottery Loan with a face value of £20,000,000 Both these transactions were repudiated by the Republican party on the overthrow of the empire in 1867. However, a part of the debt of the empire was subsequently recognized during the Díaz administration. In 1888 a 6 per cent loan of £10,500,000 was contracted in London, Berlin and Amsterdam, 20 per cent of the export and import duties and all the direct taxes on industries and landed property and buildings in the Federal District being pledged to meet the obligation thus contracted. The following year the Tehnantepec 5 per cent railway loan of £2,700,000 was made in London and Berlin and a year later silver currency bonds to the amount of \$6,700,000, bearing interest at 6 per cent, were disposed of in London and Amsterdam to meet certain pressing obligations for railway concessions and construction; and the same year another loan of £6,000,000 was made in London, Berhn and Amsterdam for the same purpose. Three years later a 6 per cent loan of £3,000,-000, secured by 12 per cent of the import and export duties, was contracted in London In 1894 the government created the 5 per cent Interior Redeemable Debt, with a view to a single new issue in which all future subventions to railways should be paid. This debt consisted of five series of \$20,000,000 each In 1899 the 5 per cent Internal Consolidated Gold Loan of £22,700,000, redeemable not later than 46 years, was issued to convert the 1888, 1890, 1893 6 per cent loans and 1889 5 per cent Railway Loan In 1903 the federal government assumed obligation to the eral government assumed obligation to the extent of £2,400,000 for the payment of the City of Mexico 5 per cent diamage loan, to meet the expenses of the diamage of the capital. The following year a 4 per cent gold bond issue of \$40,000,000 was made in London, New York and Amsterdam, partially through banks and partially privately, to meet various pressing obligations of the government. In 1910 the final loan of the Diaz government was made at 4 per cent for £22,200,000, with a view to the conversion of the 5 per cent loan of 1899. Finally, in 1913, a loan of \$200,000,000 was authorized, of which \$60,000,-000 was placed in France, with a guarantee of certain export and import duties. In June 1910, the public debt of Mexico was \$300,521,996 (Mexican silver) payable in gold, and \$137,-850,133 payable in Mexican silver, and an additional debt of \$273,398 (Mexican currency).

At the beginning of 1922 the national debt

At the beginning of 1922 the national debt of Mexico amounted to 695,050,181 pesos, and the unpaid interest thereon totaled 170,892,-417 pesos. No interest was paid on the debt in that year, but during the year the Mexican government, through its Minister of Finance,

arranged with a committee of international bankers, meeting in New York, to resume interest payments on the national debt in February 1923 However, by mutual agreement, such payments were postponed until January 1924 On 1 Sept 1925 the public debt of Mexico was stated as tollows. Debts not included in the de la Huerta Lamont Convention of 16 June 1922, capital and interest, 171,415,085 pesos; debts included in the convention, 982,136,775 pesos. The service of the debt during 1926 was estimated at 61,824,112 pesos, of which 39,-321,112 pesos was estimated as the amount requited for service on the internal debt, and 25,500,000 pesos as the amount required for service on the external debt. The amounts of interest due on the internal debt was as follows, in pesos. Bonds of the national railways, 15,000,000, to London and Mexico Bank, according to the contract of 15 Sept 1925, 1,000,-000; to other banks of emission, old indebtedness, 8,000,000, service on agrarian debt, 500,-000, amortization of certificates relative to paper money "Vera Cruz" and "Constitutionalist Army," 300,000, promissory notes of the Southern Pacific Railway, 3,031,800, to amor-Railway, 000,000, to redeem paper "unfals-ficable," 1,500,000, for payment of the annuty to the Catholic Church of California according to a decision of The Hague, 510,612; other claims, 500,000; for the redemption of the liquidation bonds of the federal government employes, 3,000,000, for national pensions, 5,310,000. On 3 Feb. 1927 J. P. Morgan & Co. of New York, announced that the International Committee of Bankers was gratified to report that "the Mexican government has completed the remittance to the committee for the benefit of the holders of the government ducct obligations the sum of \$10,692,815, being the total amount due for interest and payable by the government for 1926 under the terms of the modified agreement of October 1925, between the government and the committee. The government has also paid to the committee for the benefit of the holders of such obligations of the National Railways of Mexico, or its subsidiaries, as bear the guaranty of the government, the sum of \$2,674,097, sufficient to cover the year's requirements of such issues. The National Railways of Mexico has remitted to the committee for the benefit of the railways obligations not guaranteed by the government, a sum sufficient to enable the committee to pay the eash warrants due to and including 1 July 1924, upon that class of railway debt.

On 30 June 1923, the banks of Mexico had in circulation notes to the value of 75,047,486 pesos. On 1 Sept. 1925 the National Bank of Mexico was established with an authorized capital of 100,000,000 gold pesos, of which 57,500,590 pesos had been paid up by 31 Oct. 1925.

Interest on the national debt was defaulted in 1914 and remained in default until 1939. In 1937 the direct debt was 1,104,322,148 pesos; indirect debt 97,161,928 pesos. Payments under the so-called bankers' agreement had reduced the total by 07,489,164 pesos, leaving a net debt of 1,133,994,612 pesos. The total of direct American investments in Mexico in 1937 was \$479,465,000. Of this total \$213,373,000 was in mining and smelting; \$09,039 in petroleum;

\$147,804,000 in public utilities and railroads, and \$17,217,000 in agriculture. In 1937-38 many ranches and all of the petroleum industry were expropriated by the government and put under control of workers and government agencies. The estimated revenues in 1939 were estimated at 415,005,943 pesos and expenditures at a balancing figure. The peso, Mexican monetary unit, has a legal value of 75 gramme of pure gold. Gold coins, 20, 10, 5, 2½ and 2 pesos are 90 per cent gold, 10 per cent copper. Minor comage is of silver, bronze and nickel. Principal revenues are from stamp taxes, direct taxes and export and import duties.

8. GOVERNMENT. The constitution of Mexico is based upon that of the United States which it very much resembles The republic is formed of free and sovereign states which, for administrative matters concerning the interests of the nation as a whole, are united under a tederal government. In virtue of the constitution of 5 Feb 1857 the national power resides in the people, who are the source of all public authority. The administration of the affairs of the country is carried on by the national government, for the sederation, and by each state government for its own state. But no state law may conflict with the general good as expressed by the laws of the federation. Slavery is prohibited by the constitution and all persons born in the republic are free and equal in the eyes of the law, and every one has a right to licedom of thought, profession and occupation In so far as it is consistent with private rights and the exigencies of state, the press is fiee. In Mexico one may publish what he pleases, for there is no press censorship; but the citizen and the government are protected by libel laws Newspaper, magazine and other presses cannot now, as formerly, be confiscated as instruments of crime. The right to associate together for any lawful undertaking, business or enterprise, and the complete individuality of every law-abiding citizen of the republic or resident therein are recognized and all may leave or enter the country without passport. Mexico being a republic, hereditary honors and titles of nobility are not recognized and no one is permitted to accept or wear them unless by special act of Congress Arms may be carried for lawful personal defense in certain parts of the country, whereas in others a permit to do so must be obtained; for the law recognizes that in mining camps, wild mountainous regions and unsettled parts of the republic, arms are necessary for self-protection, and here a permit is not exacted. Search without warrant is prohibited, and a policeman may not enter a private house without authorization from the police court, unless it be in pursuit of a well-known criminal or one caught in the act of breaking the law Privileged tribunals such as were customary during the Spanish occupa-tion of the country are strictly prohibited; and every man, be he priest or layman, citizen or administrative officer of the government, is ruled and governed by one common law. The passage of laws contrary to the interests of the nation is prohibited, and no treaties can be made with foreign countries for the extradition of political offenders. According to the constitution and the law of the land offenses against law and order are divided into two great classes, civil and criminal. No one may be

impusoned for offenses coming under the first of these heads This provision includes debts and other monetary obligations, provided there is nothing criminal about their contraction. A person once arrested must be brought to trial within three days and just cause shown for his detention, or he must be set free. Whipping, torture, mutilation and other punishments of a like nature, common enough in previous periods of the history of the country, are declared contrary to law. All punishments except those of a correctional nature must be administered by judges of the criminal courts. The death penalty is practically never exacted in Mexico in times of peace. It is stipulated in the con-stitution, however, that it may be applied in cases of high treason, premeditated murder, parricide and highway robberies; but never for political offenses, except in time of war. In practice, however, about the only cases in which it is exacted, in normal times, are those of offenses of a most serious nature against military authority. In all legal actions one may appeal from a lower to a higher court until the Supreme Court of the nation is reached and gives its decision, which is final. But in cases of the death penalty, an appeal may be made to the clemency of the President of the re-Once a man has been tried and acquitted he cannot be tried again for the same In conformity with the principles of democratic government no spying upon the privacy of the people of the land is permitted and, on the same principle, all private correspondence is declared inviolable. The quartering of soldiers upon private individuals in time of peace is prohibited, and even in time of war it can be done only in conformity with certain regulations of Congress and through special orders issued to fit the exigencies of the occasion Patents may be issued for a certain stated time on inventions of use to mankind, although the constitution states that no monopolies shall exist in the country except such as the government may take to itself for the general good of the nation; as, for the coinage of money and the control of the postal system. In the case of serious internal disorder of whatever character, which threatens the safety of state or govern-ment, the President has the right to suspend the constitutional guarantees; as he also has in the case of foreign invasion But this can be done only with the consent of his cabinet and Congress, or of the congressional committee when the Congress is not in session

All persons acquiring land in Mexico become by virtue of this acquisition Mexican citizens, unless they distinctly state in their deed of acquisition that they reserve their right to the citizenship of their native land. One of the radical changes of the Queretaro convention (31 Jan 1917) is the provision that only Mexican citizens, by birth or naturalization, may acquire landed properties or water rights or obtain concessions to exploit mines or combustibles; but the state may concede such right to foreigners who appear before the Secretary of Foreign Relations and agree to be considered as Mexicans, in so far as the titles involved are concerned and agree not to invoke, in regard to the same, the protection of their respective governments, under penalty, for violation of these provisions, of losing the titles

thus acquired, which automatically revert to the nation. All Mexican citizens, whether native born or naturalized, are hable to military service. All persons resident within the republic are guaranteed the protection of the laws of the land.

The state government is divided into three branches, executive, legislative and judicial The chamber of deputies and the senate, constituting the Congress of the union, are the legislative bodies, and by them alone can laws for the government of the country be enacted Two sessions of Congress are held each year. The first, which begins on the first day of Apul, lasts from two to two and a half months, and its primary business is to audit all accounts of the previous year and to arrange the estimates for the incoming fiscal year second, which begins on to September, lasts for from three to four months. The law provides for the election of a President of the republic who shall serve for a term of six years and shall not be re-elected for a consecutive term, and a Cabinet made up as follows. Labor and agriculture, foreign affairs, interior, commerce, fmance, communications and public works and war and marme. The Constitutional party, recognizing that the constitution of 1857, with the various amendments thereto, was unsuited, in certain important respects, to the conditions under which the Mexican people live, decided to make such changes in it as seemed neces sary for the welfare of the nation. To this end a convention was held in Queretaro (December 1916) After two months' deliberation it closed its labors on 31 Jan 1917, having te formed, in a radical manner, a number of the most important sections of the basic constitution. According to these changes the office of Vice-President of the nation is done away with and the filling of that of President, in case of the death or absence of the chief executive of the nation, is left in the hands of Congress. The age of compulsory primary education is raised to 15 years and all parents or guardians are under obligation to see to it that then children or wards receive primary, secondary and military education. Instruction in all gov ernment schools and in all primary private schools must be laid, and no ministers, priests of officials of religious organizations or socie ties may establish or own schools or teach in Mexican schools. This abolishes the church schools which, before the revolution of 1910, ministered to fully two-fifths of the educational needs of the country. To make up the deficiencies in educational facilities thus caused the new reforms in the constitution declare it obligatory upon all agricultural, mining and industrial companies, resident outside of towns, to establish and maintain schools for the education of the children of the people in their employ or resident on their property. All schools, whether official or private, must subschools to official or private, must subschools. mit to official inspection and follow the government program of studies.

The constitutional amendments of 31 Jan. 1917 provide for the subdivision of large landed estates, aiming in this way to solve the land problem, which formed one of the causes of the revolution of 1910. Each state or territory is empowered to fix the largest amount of land which any person or company may hold, and all landed properties in excess of this

amount must be subdivided and sold off within a certain stated time, and in accordance with official regulations, otherwise they are subject to confiscation. One of these conditions provides that at least 30 years shall be allowed to the purchaser in which to acquire property rights by making stated yearly payments. During this time no mortgage can be placed on the property thus acquired and the interest charged cannot be greater than 5 per cent. No hen of any kind can be placed upon homestead properties not can they be seized for debt or other causes. In theory all land, minerals and other resources of the country are the property of the nation, and this position is maintained by the constitutional amendments of 1917, and the theory itself is put forward as a justification for the subdivision, by order of the legislature, of large landed estates and the national control of oil, numeral and water rights, with a view to the more equal distribution of the wealth of the nation and the encomagement of small landed proprietors. To hold mining properties it is necessary to work them, and no company may acquire and retain possession of more land than is actually necessary for the carrying on successfully of the business of the concern, whether it be mining, agricultural or industrial.

As the Constitutionalist party, when it rose in arms against the Diaz government, proclaimed the rights of the Mexican people to govern themselves in a direct and democratic manner and demanded the immediate solution of the agricultural questions lacing the nation, pro-claiming, at the same time, the rights of the masses, naturally these retorms find a prominent place in the changes made in the constitu-tion by the convention of 1917. These are rad-ical and far reaching. The new labor laws provide for an eight hour day with six days' labor a week, while night work is restricted to seven hours and when it is of a dangerous and un-healthy character, it is altogether prohibited for women and children under 16 years of age, while children under 12 may not be employed in any contract work. Commercial establishments may not work their employees after 10 P.M.; and children between 12 and 16 must not be worked for more than six hours a day. Women shall not be required to do hard labor for three months before childbirth. and they may not work for one month after, but they shall be paid for this mouth and they shall retain their positions and all the rights of their contracts. They shall also be allowed two rest periods each day during the time they are nursing. The minimum salary in every district of the country shall be such as to provide for the necessities of life, the education of children and honest amusements. In all farming, commercial, manufacturing and mining enterprises the employees have the right to participate in the profits of the business, and the percentage of such participation hess, and the percentage of such participation shall be fixed, in each community, by a commission acting under the central commission of conciliation which, by law, is established in each state. There shall be no distinction in salary by reason of sex or nationality, for the same work Farming, mining and industrial companies must provide, outside the cities and larger towns, proper sanitary dwellings, markets, hospitals and other conveniences

necessary to the life of the community, and when the employees number 200 municipal buildings and recreation grounds shall be prowided within which no intoxicating liquors shall be sold not gambling permitted. Employees may lawfully form combinations to protect their interests and the right to strike and to close down is recognized. The work-men must, however, give 10 days' notice to the Commission of Conciliation and Arbitration before striking, and they are not allowed to use violence of any kind in the attempt to enforce their demands. An exception to this tule is, however, made in the case of government employees in ammunition factories, which are under the authority of the army and thus subject to military discipline. A complete close down shall be legal only when the excess of production makes suspension of work necessary to maintain pieces at a reasonable rate, but approval for such close-down must first be obtained from the Committee on Conciliation and Arbitiation, which shall be formed of an equal number of representatives of capital and labor together with one additional member representing the government. Any employer refusing to submit his case to the commission or to abide by its decision for feits all right to any contracts already made with his employees and becomes obligated to pay them three months' salary. Should the workmen refuse the offer of the commission their contracts automatically become void. An employer who discharges an employee because he has joined a union or taken part in a legal strike or without any just cause shall be obliged, at the option of the workman, to pay three months' salary or to continue the contract. The law provides for free municipal employment bureaus and stipulates that, when a Mexican workman contracts to go to work outside Mexico, the contract thus made must be approved by the municipal authorities and viséed by the consul of the country to which he is about to go, and one of its provisions shall be that the employer must provide the means for the return of the workman to his native land. No part of a salary may be retained as a fine, as was formerly the case; no salaries may be paid in a saloon or place of amusement, and no workman may require his rights to indemnity for man may renounce his rights to indemnity for accident. No labor contract can be for more than one year, and in such contracts the laborer cannot renounce any of the rights guaranteed him by law. The only redress for the viola-tion of a contract on the part of the employer or employee is a civil action.

or employee is a civil action.

Consult Coronado, M. (Elementos de derecho constitucional mexicano) (2d ed., Guadalajara 1899); Dodd, W. E., (Modern Constitutions) (Chicago 1909); Gamboa, J. M., (Leyes constitucionales de México durante el siglo XIX) (Mexico 1901); Granados, R. García, (La constitución de 1857 y las leyes de reforma en México) (Mexico 1906); Pan-American Bulletin (issues of 1917-19, Washington, D. C); Wheless, J., (Compendium of the Laws of Mexico) (2 vols., 1910); Winton, (Mexico Past and Present) (1928).

9. ARMY AND NAVY. Owing to the many revolutions and upheavals through which Mexico has passed since it became an independent country in 1821, the armed forces of the republic have been a constantly varying quan-

tity At the time of the collapse of the Maximilian empire in 1867 there were four great military centres, the north, the west, the centre, and the southeast When Poinrio Díaz took the city of Mexico in 1867 he had under his command more men than he had in the whole military force of the republic in 1910, when he was faced with an uprising which was destined, in less than a year, to send him into exile from which he never returned Juarez, who, on the death of Maximilian, was acknowledged everywhere as the legitimate ruler of Mexico, found one of his greatest problems in the reduction of the armed forces which he had inherited from the prolonged conflict against the French, the clericals and the Reactionary party. He proceeded to solve it by dismissing from service hundreds of soldiers and officers, many of whom, being unfitted for civic life and having no means of making a living, became a constant thorn in the already troubled side of the executive Bandits roamed the country and made so bold as to even invade the capital itself Robbers, on a less pretenthe capital lists. Robbert, on a less precent tools scale, were everywhere, and most of them had either been formed from or organized by the dismissed soldiers of the republic or the forces of the Reactionary party Diaz faced the same condition of affairs when he came into power in 1876. But he was wiser in his day than Juárez had been in his, probably because he was a thorough soldier and understood the soldier's point of view. He saw, in the very restless element that had given the Indian President so much trouble, the raw material out of which to create a rampart against the lawlessness that had overrin the land. In the course of a few years he had organized out of this unpromising material the rurales (rural guard), which became as famous in Mexico as the Northwest Mounted Police is in Canada. These guardians of the peace, which were to be found in organized groups in the towns, cities and villages throughout the country, were military in every sense except that they were under the jurisdiction of the Department of the Interior (Gobernación) instead of that of War. However, in the last few months of the Diaz administration (1911), the rurales were placed under the jurisdiction of the War Department, for strictly military considerations. Throughout the trouble they remained, for the most part, faithful to the government, but becoming later on disorganized through the many political changes that followed one another in rapid succession, they were finally disbanded. Throughout his long term of office, which extended from 1876 to 1880 and from 1884 to 1911, General Díaz gradually reduced the military force of the republic and aimed at increasing its efficiency. In 1910 the standing army of the republic consisted of less than 1,000 commissioned officers of all grades and less than 25,000 non-commissioned officers and men. Thus the government, which had been lulled into fancied security, through the years of peace which had followed the assumption of the presidency by Díaz, found itself unprepared to deal with a revolution like that of Madero, which affected the greater part of the country. The peace standing of the Mexican army was, in 1914 Commissioned officers, 3,112; non-commissioned officers and men, 26,431. The expenses of the maintenance of the armed

forces of the republic, the garrisons, etc, was, in the fiscal year ending 30 June 1911, over \$40,000,000 Mexican money, or more than one-third of the whole revenue of the republic. As this amount embraces only the forces of the de facto government, it is probable that nearly as much more was spent in the maintenance of the revolutionary forces then in the field against the former. On 30 June 1916, A. G. Garcia, Mexican inspector of consulates stationed in the United States, gave the strength of the Constitutionalist army as 175,000 officers and men, all of which he claimed were well armed and uniformed Other authorities place the Constitutionalist forces at between 85,000 and 100,000. During the Díaz regime many new barracks were built and many old ones were modernized. Military education is provided in the National Military School in Chapultepec, which occupies a part of the famous Chapultepec building, the official residence of the President of Mexico. There are dence of the President of Mexico generally about 300 students in attendance, all being trained for officers in the Mexican Army at government expense. The school also offers an excellent post-graduate course in advanced engineering, topography, military jurisprudence, ordnance, military history, advanced military tactics, etc. Under the constitution, every Mexican citizen is hable for military service in the active army or in the national guard. A new comput sory military service act became a law on 18 June 1910, but because of administrative difficulties, it was decided to postpone putting the meas ure into effect. To combat illiteracy in the Army, 165 regimental schools have been established. The army is organized into 50 battalions of infantry, 40 regiments of cavalry, 2 regiments of military police, 2 marine corps, 2 regiments of artillery, and 3 detached companies. A school of aviation has been established, and in 1940 the air force comprised 2 regiments each of 3 squadrons with 51 planes.

The Mexican navy is little more than a police force, consisting of 6 escort vessels, 10 coast-guard patrol vessels and other minor craft.

10, EDUCATION. The early history of education in Mexico is particularly interesting. In 1529, the College of San Juan de Letran was established in the capital and threw its doors open to Spaniards and Indians alike. The first university was opened in 1553 by special permission of the King of Spain. In 1573 two colleges, San Gregorio and San Ildefonso, were opened; and two others and a divinity school were established a few years later. Thus seven institutions of higher education were in operation in Mexico before the close of the 16th century. It was not, however, until 1578 that the science of medicine was recognized as menting a place among the branches of higher education, the first chair of medicine being established in that year. Twenty-one years later another medical professorship was founded, and in 1081 anatomy and surgery were added. The Royal College of Surgeons, established in the city of Mexico in 1768, still exists as the National School of Medicine, a name adopted in 1815. Its home is the building made famous as the residence of the Spanish Inquisition. The Mining College, or School of Engineering, established in 1793, occupies an edifice built by the famous Spanish architect Manuel Tolsa, at a cost of \$3,000,000, and is in a most flourishing condition. Although the Spanish conquerors of the Aztecs

were largely inspired by avarice, cupidity and brutality in their treatment of them, they were sincerely devoted to the cause of higher education and contributed liberally from public revenues and private fortunes to its advancement. In the city of Mexico there was founded, in 1551 by the Spanish Crown, the first university m North America, 200 years before the inde-pendency of the United States. The National Academy of Art occupies a building on the site of which was the home of the first European school of the new world, a school for Indians. The first normal school for males and its companion school for temales occupied historic buildings completed respectively in 1678 and 1648, the Jesuit College of San Ildefonso erected in 1719 at a cost of \$100,000, is now the home of in 1719 at a cost of phaspar the National Preparatory School (a part of the Managar University of Mexico)—The National Library, with its more than 100,000 volumes. was formerly the Convent of San Augustin, The building in which is now located the National Museum dates back to 1/31 and cost \$1,000,000 and The College for Young Women now occupies a roomy structure completed in 1731 at a cost of \$2,000,000. Thus are education and history closely intertwined in Mexico

When Porfino Díaz was first elected President in 1876 there were only about 4,000 public schools in the entire republic. From the coming of the Spannards the chief interest in education had been confined to the higher branches, to the establishment of seminaries, colleges and universities, and the primary of fundamental branches were neglected. Under Díaz there resulted a noteworthy increase of schools and attendance.

Under the law, primary education in Mexico is secular, free and compulsory for all children between the ages of 7 and 12 or 14 years. The primary course in the Federal District is six years in length, after the completion of which the pupil may enter a secondary school.

The number of students in attendance in day schools in the republic during the school year 1935-36.

These figures have changed considerably since the institution of the Six Year Plan, which called for great increases in the number of public schools and changes in the type of instruction in all schools, public and private. Many private schools were abolished and those remaining open were required to submit to governmental control of curricula. By 1939, 67,075,000 pesos of the total 445,876,000 pesos budget went for education.

In 1931 the Third Article of the Constitution was changed to make education socialist in character. The Plan de Acción (1935) of the Munstry of Education proclaimed that education should be brought within the movement, originating in the revolution, toward an equalitarian society. Teachers received guidance in the new system by the Instituto de Orientación Socialista. Pamphlets and books carried the program to the students. However, as late as 1942 the Mexican education system seemed to lack some of the inspired fervor which so stimulated it when José Vasconcelos was Minister of Education under Obregón, and to lack also the fine uplifting and

guiding hand of a leader like Moisés Sáenz who directed it under Calles Sáenz was probably the most able educator in Mexican history.

In 1937 a Department of Workers' Education was created and night schools subsequently have been opened in the Federal District to give general and especially art instruction to adults. These tree coeducational schools offer workers education on several levels—primary night schools, with six-year courses, nine-year night schools, and secondary night schools, in addition to courses in air given at three centers. In the 1938-39 period the registration in primary night schools reached the number of 12,412, the 13 nine-year schools had 7,440 m attendance, secondary night students numbered 2,381 adults In art schools receiving instruction in music, plastic arts, histinonics, and the history of culture, were 743 men and 416 women.

The following table recapitulates the report of the Muustry of Education in the number of adult schools existing throughout the nation in

1939.

	Total	schools
Model	15	13
City		74
Semigiban		215
Rutal	8,951	8,055

It should be borne in mind that many of these schools really are plants used at other times for

the education of Mexican youth.

The government has issued several million textbooks free for students of day and night schools in all parts of the republic. The Mexican education program under President Cárdenas made significant progress in reaching more and more of Mexico's uneducated lower classes. President Manuel Avila Camacho called (1941) for the discontinuation of coeducation for students attending primary and secondary schools. The secondary schools are maintained by the states with the exception of the National Preparatory School in Mexico City. This institution is operated as a model for the rest of the country. It compuses two divisions, as reorganized in 1923. There are numerous industrial schools of various types scattered throughout the republic. The government also encourages vocational training in all primary and secondary schools. Agricultural instruction is given in advanced schools at Mexico City, and in elementary schools elsewhere. There are commercial schools in all of the principal cities, and at Mexico City is the Advanced School of Commerce and Administration There are state normal schools for the training of teachers, and, in addition, the federal government maintains 12 such institutions, of which nine are for the training of teachers in rural and special «antiilliteracy» schools. At Mexico City there is a normal school which gives a five-year course for primary graduates, and a teachers' college is connected with the National University.

During the decade of 1930 to 1940 nearly 10,000 new rural schools were established, and the proportion of the national budget allocated to education was increased to nearly 20 per cent until expenditures necessitated by the war program caused it to decline. There are several problems facing Mexican education including lack of unified direction and co-operation; extremely low salaries which drive incipient teachers into other fields of endeavor; and too much politics in the educational program.

The federal and state governments share control of the education system The former has jurisdiction over schools in the Federal District and the territories. It also supports a number of the professional, vocational, and other schools, and even operates a considerable number of model primary schools. The Secre-tary of Public Education is a member of the Cabinet. Each state employs a Director of Public Instruction or similar officer.

The National Library, which has a large and very convenient building and location in the capital, is a noteworthy institution. In its collection of more than 800,000 volumes are many rare books and manuscripts Among these are works by early Spanish historians and scholars written before the art of printing was known A very large proportion of the volumes in this library was originally the property of the church or of the priesthood and the books were confiscated by the government during the progress of the war of reform Naturally many of them deal with religion, literature, language or history. Of similar character are While there are most of the state libraries some 45 public museums in the republic many of which are quite extensive and all of which are exceedingly interesting and instructive, far greater importance attaches to the National Museum in the city of Mexico, than to all others combined Although it has occupied its present quarters in the National Palace only since 1865, it was established in 1831, with the collections previously belonging to the Conservatory of Antiquities founded by Emperor Iturbide in 1822, and to the Royal University, to which Viceroy Bucareli y Ursula had in 1775 transferred the remnants of a most valuable collection of maps, hieroglyphs on skins, manuscripts, etc. These were consolidated under the name of the National Museum Here the student of archæology, of ethnology or of any other department of the ancient history of the American continent, or of the peoples who have at different periods dwelt upon it, may find greater wealth of material for investigation and study than exists in any similar institution in the western world While there are also a number of very important art collections in the principal state capitals, the National Gallery, in the city of Mexico, holds unquestioned pre-eminence Of literary and scientific societies there are many in Mexico Every considerable community is the home of one or more of these associations, some of which have been in existence many years

The Revolutionary party of 1910 was unreservedly committed to the education of the masses; but the burden was unloaded upon the individual states and communities over which the federal government retained supervisory rights but with no central control. The Constitutional party has shown itself strongly opposed to church control of schools of any kind, whether public or private In Mexico the city schools are fairly good, while those of the towns and villages and the country districts are very elementary and poor This is due to lack of funds for the maintenance of public schools and the difficulty of getting capable teachers for the salaries paid. The plan of organization of the Mexican schools is more French than American. Primary instruction covers four years and the high school course two. Four years of preparatory school duties lead to the university, which is much more academic in form that in the United States, so much so, in fact, that the work covered by the National University, as it is now constituted, was known, previous to 1913, as "the course of higher studies" But the Revolutionary party did away with the cabinet office of Minister of Public Instruction, giving to the arts depart ment of the university its old name of the National Preparatory School and erecting the post-graduate school into a university. Whereas previous to this all education had been without charge, the new educational law exacts a fee of \$5 a month in both the preparatory school and the university, with all their allthated schools, like those of medicine, law, dentistry, engineering, etc. (17 Jan 1916). For some years past the tendency of Mexican pub. he education has been toward the practical at the expense of the academic, and this tendency has been accentuated by the changes recently made Military instruction is made obligatory; French and English have been reduced from a three to a two-year course and much attention is paid to manual training.

The National Department of Education has special divisions for primary and normal schools, secondary schools, technical schools and commercial schools, the National University, education of the indigenes, educational psychology and hygiene, fine arts and libraries. The library division has established nearly 1,000 popular and circulating libraries to which approximately 350,000 volumes have been distributed free Efforts are being made to extend elementary and vocational education to all classes through night schools, cultural centres for the giving of lectures, etc. A feature of the educational system is the sending of so-called (missionary) teachers into the remote districts to inculcate in the natives a knowledge of hygiene and useful industries. In the city schools, modern ideas with respect to medical inspection, school linches, and physical instruction are being put into practice.

The National University of Mexico, founded in 1553, is one of the most famous Latin American universities. It comprises schools of law, medicine, chemistry and pharmacy, dentistry, engineering, natural sciences, liberal arts, fine arts, music and theatrical art. It also operates a summer school, the first to be organized in Latin America, which attracts numbers of students from both Mexico and the United States Reorganized in 1910, it was granted full autonomy in 1929. Other universities, enjoying a certain degree of autonomy, include the National University of the Southeast at Merida (Yucatan); the State University of Michoacán at Morelia, the University of San Luis Potos; and universities at Nievo León (founded in 1933); Puebla; Jalisco at Guadalajata (founded in 1792, closed in 1860, reopened in 1925), and Veraciuz. The Military Academy, the School of Mines, the Library School, the International School of Archaeology and Istinology, and numerous other scientific institutions and societies are located at Mexico City. There is also a Workers' University in Mexico City.

The National Preparatory School in Mexico City (the old arts department of the National University), was reorganized in 1923 and consists of two divisions. The lower division

maintains a three years' course in mathematics, physics, chemistry, biology, history, economics, Spanish language and literature, foreign languages, drawing, modeling, trade instruction, and choral singing. The upper division, covering two years, offers ten different pre-professional courses, most of which inclinds logic, history, foreign languages, economic and social recognaphy. Hiterates still country about 60 per cent of the total population of the country.

11. RELIGION. There is complete separation of church and state in Mexico (since 1873), and the reforms made in the constitution in 1917 reallirin with great emphasis the fact that the church, of whatever creed or denomination, is constantly under the most strict government inspection and that all ecclesastical buildings, lands and other property belonging to the nation, which extends their use to the church. So, therefore, no relipious order or denomination can acquire land or other property or mortgages on the same. This prohibition extends to school and college buildings, asylums, charitable institutions and residences of ministers and priests and even to the property collected within the walls of the chinches and other ecclesiastical buildings. Gifts of movable property may be made to the church, but even these at once automatically become the property of the nation. Every church or religious society occupying property must elect an official head to represent it before the government and to become responsible for the national property in its possession. All ministers of whatever cult must be Mexican by bitth. The provisions of the reforms made in the Constitution in 1917 shut out of Mexican religious institutions fully 2,500 Spanish priests of the Catholic Church alone, hundreds of French priests, employed principally in schools and colleges, and the Protestant ministers, mostly American, who had established numerous churches and opened many schools throughout the land. While all religions not inimical to the interests of good government and the laws of the land are allowed to exist and to exercise their functions in Mexico, yet all public religious observances and ceremonies must be carried on within the church property and are subject to official in-spection and regulation. The law does not recognize the personality of any sect. The legislature of each state is empowered to regulate the maximum number of churches and ministers within the state. No minister shall have the right to vote, to hold any public office, or to be voted for, nor is he permitted to take part, in any way, in public affairs. The establishment of monasteries and numeries and the taking of monastic yows are prohibited by the Constitution, which asserts that the state may not permit the fulfillment of any contract, pact or agreement the object of which is the curtailment, loss or irrevocable sacrifice of the liberty of man, whether for the purposes of work, education or religious vows. On 11 Feb. 1926. President Calles ordered the attorneygeneral to declare that all church property not already in the possession of the state had been nationalized and to issue orders for the ar-rest and deportation of all foreign priests, Roman Catholic and Protestant dergymen alike. The deportations in many cases were accompanied by noting and bloodshed.

12. MYTHOLOGY. Prior to the European occupation Mexico and Central America were inhabited by races possessing a long history and a semi historical mythology, manifold in its ramifications and rich in its internal de-Within this mythology was the very heart of those nations and peoples, for round it clustered their social and political institutions and their industrial life Though it differed with the different peoples, funda-mentally it was everywhere similar. The same thing had taken place in Mexico that had happened to the mythologies of the Indo-European races in Europe Different tribes of the same great linguistic family had separated from one another and, in their migrations from place to place, during the more or less nomadic stages of their existence, they had, later on, come together again. During these wanderings they had forgotten one another and when they Yet so met again it was as alien peoples similar were their institutions, languages, religious beliefs and the general course of their existence that they frequently blended and became more or less one people. This happened to the remnant of the Toltees left on the upland plateaux of Mexico after the overthrow of their empire; to the Chichimeeas and to the various other tribes forming the Aztec Empire at the time of the Conquest

After their long migrations from their primitive home, migrations which covered centuries, the Nahuatl races met as strangers in the valley of Mexico and surrounding country The blending to which we have just referred was imperfect. Thus among the Toltecs we find the deity to whom most deference was paid was Quetzalcoatl; among the Aztecs it was Huitzilopochth, god of war, among the Texcocans, Texcatlipoca, god of the air, among the Tlaxcalans, Camaxth; among the Otomi, Mixcoatl, god of the chase. Like the Romans, the Greeks and many other civilized peoples of pre-Christian times, the Mexicans were accustomed to adopt the gods of other races with whom they came into contact, more especially if the mythology of these races was closely related to their own. The natural result was the very curious mingling of mythologies Huitzi-lopochtli, Quetzalcoatl and Tezcathpoca were all gods of the air, and they have so many characteristics in common there is little doubt they were originally one tribal divinity common to all the people who spoke the Nahuatl tongue at a time prior to the separation of the tribes. In fact, in Mexican mythology, these three gods are represented as brothers, and in every part of the Aztec Empire where Nahmatl was spoken they were the foremost In Tenochtitlán (Mexico City), divinities where Huitzilopochtli was all powerful, in his great temple, a statue and an altar had been erected to Quetzalcoatl. At Cholula, the heart of the Aztec empire, stood the greatest of the pyramids of Mexico, with its famous shrine, both erected to the worship of the Feathered-Serpent god of the Toltecs. But its worshippers were not confined to the remnants of the Toltecs who had become incorporated into the Mexican nation. Peoples of various races, Aztecs. Colhuas, Zapotecas, Mixtecas, traveled

from the furthest confines of the empire and from beyond it to pay their devotions at the shrine of this once powerful divinity. Yet in Cholula, where the cult of Quetzalcoatl was all powerful, Huitzilopochtli also held a place by the side of the Toltec god himself

In Texcoco, the reputed centre of the advanced culture of the Mexican Empire, while Tezcatlipoca occupied the place of most importance in the native pantheon, just below him stood Quetzalcoatl and Huitzilopochtli. As the superior culture, refinement and intelligence of the Texcocans gradually came to exert an all-powerful influence over the rest of the Aztec Empire, their chief divinity, little by little, gained more importance in the Nahuatl pantheon, until at last he secured recognition which gave him, among the nobles and cultured class at least, a standing above that of the other tribal gods

Gods of the Air.— To understand the currous relationship of these Mexican divinities it is necessary to remember that they were all gods of the air and that they had, in general, common functions, attributes and powers Camaxtli, the war god of the Tlaxcalans, was accognized by the Mexicans as being the equivalent of their own Huitzilopochtli, while the Tlaxcalans held that he was identical with Mixcoatl, the Otomi god of the chase Among these three peoples this deity was designated by more or less the same insigma But he also wore upon his face and body the colors of the morning star, as did also Quetzalcoatl; he carried the lightning dart, which proclaimed him god of war, and at the same time con-nected him with the divinities of the wind, the lightning and the thunder Mixcoatl, who had two temples in Tenochitlan, also wore the

symbols of the god of the arr.

The same fate befell the mythology of Yucatan Itzamná, the older culture god of the peninsula, was the popular culture hero of the Itzaes, the first of the historical races who overran Yucatán and the adjacent territory; while Kukulcán was the tribal god of the Mayas Yet both divinities were recognized by the Mayas and the Itzaes; the shrines of both were to be found in the centres of the religious cult of the peninsula and to them came pilgrims from Chiapas, Guatemala and all southern Mexico, generally over well-paved stone roads which now lie buried in impene-

trable forests

The Kiches of Guatemala called their culture divinity Gucumatz, "Green Feathered Serpent," a name indicative of divine intelligence; and the Mixtecas, hundreds of miles away on the west coast of Mexico, named theirs Yucano, the "Bright Light," a term having practically the same significance But everywhere in the south, as among the Toltecs and the Aztecs, the traditions and offices of this great intertribal divinity were the same. He was the god of the winds, the thunder and the lightning, of the morning star, of fire and of light, the apostle of culture, the patron of merchants, the inventor of language, literature and art, the special divinity of athletes and sportsmen, artisans and thieves To him, under one name or other, was erected all that was beautiful in the builder's art He was the terrestrial representative of the great sun sent to teach the people of the earth the arts and sciences He was the originator of the Toltec, Aztec, Kiche, Maya, Zapoteca and Mixteca calendars and systems of hieroglyphic writing, and he is credited with having given names to animals, plants, minerals, places and geographical divisions. He was the great physician and the inventor of medicine; music and poetry, too, were his gifts to humanity. In short, he was a universal culture god whose powers and benefactions were bounded only by the advancement in civilization and the breadth of imagination of each of the many tribes and nations unto whom tradition represents him as ministering.

Creation Myth. The Nahuatls believed that before the creation of the universe there existed a region inhabited by the creator, Tonacatecuth (Ometecuth), and his consort, Tonacacihuatl (Omeciliuatl), who had four sons, Tezcatlipoca, Huitzilopochtli, Quetzalcoatl and Yayauqui When the youngest of these was 600 years old the gods appointed Quetzalcoatl and Huitzilopochili as their representatives The two executors created a fire and a demi-sun, and then two human beings, Oxomoco and his wife. Cipactonatl To the Oxomoco and his wife, Cipactonall To the man they gave the art of cultivating the ground and to the woman those of spinning, weaving and prophecy. They then created Mictlán Tecutli and his wife, Mictlán Ciliuatl, Lord and Lady of Mictlán. They divided time into days, months and years; and below the shining residence of Tonaca Tecutli, in the 13th respectively. gion, they created eight heavens, the first of which was inhabited by two stars, male and female; the second by Tetzahua Cilinatl (woman skeletons), whose business is said to have been to devour humanity at the end of the world. In the third heaven were men of all colors; in the fourth birds which descended to the earth. The fifth was the home and birthplace of fiery serpents, comets and falling stars, the sixth the dwelling place of the wind; the seventh that of dust, and the eighth that of the gods Tlaloc and his consort, Chalchiutlicue, were also created as masters of the waters in the heavens above and upon the carth be-low Tlaloc, in turn, created a great number of little servants, all of whom were known as Tlalocs, while he himself bore the title of Tlalocaltecutli, "Lord of the Tlalocs." His pigmy servants distributed the water wherever Tlaloc ordered them to, and sent it down upon the earth in the shape of rain, where it was again taken in charge by other little Tlalocs Whenever one of these was unfortunate enough to break the jar in which he carried the water the crash of the fall produced thunder, and when a flying fragment hit some mortal, men said he had been struck by lightning.

The sun created by the gods went half way across the heavens and then returned upon its tracks or, according to another version, it rose only a short distance above the horizon and stopped there, and its rays were very feeble, consequently the earth was dimly lighted. Both it and the moon were accustomed to wander about the heavens; so Tezcatomed to wander about the heavens; so Tezcatomed an era of sun-creation resulting in the making of four separate luminaries.

The Deluge.— There are different accounts of the creation of these suns and even the order in which they were created is disputed;

but that their periods of existence represent four separate ages of the world is agreed by When the first sun, Atonatiuh ("watersun"), was destroyed a great deluge descended inpon the earth, when Phecatonatuh ("windsum"), met with a like fate, an all-devasating wind was created, and when Tletonatuh ("firesun") ceased to exist, everything upon earth was destroyed by an all consuming fire. Then followed Tlatonatiuh ("earth sim"), who created all things as they now exist. Thus, according to Nahua tradition, the human race was swept from the earth three separate times, and people were in constant lear that a fourth destruction was to come, for they believed the four elements, earth, an, tire and water, were in constant conflict, and that for this reason they had already caused previous destructions of the world. After each of these destructions the earth had been repeopled by those who escaped. After the first inhabitants of the earth had disappeared, Coxcox and his wife, Teocipaeth, escaped in a boat and landed on Mount Collugean. They were the progenitors of many children who were all dumb; but one day a bird, from the top of a free, taught them to speak. They all spoke different languages, however. Hence the diversity of tongues

Origin of Mankind. According to one myth, after the destruction of the earth by fire, by Tezcathpoca, Camaxth Huitzilopochtli sat upon a rock and, striking it with his wand, caused the first race—the Chichimeca-Otom—to come forth and people the earth

According to an Aztec myth, the first men emerged from a place called Chicomoztoc (Seven-Caves); and this mythological starting-point figures in all accounts of their wanderings. It was probably the place from which the seven tribes set out on their migrations southward, and at the end of which they arrived of the million of Mariene 19.

Mexican Religion. The Mexican had over 300 deities, some of whom had been borrowed from neighboring tribes and all of whom may properly be classed as nature gods. In addition to these they acknowledged a supreme being, whom they represented as the Lifegiver, Ipalicinoani, "He who gives us life," and Tloquenahuaque, the "All embracing." This supreme being was never represented by picture or image and no sacrifices of any kind were offered to him. He was known as "Teotl," the god, and seems to have been identified with the Sun, and at times with Tezcatlipoca. The hieroglyphic by which he is represented is the same as that of the Sun. Tlacatecolotl, "Reasoning Owl," the enemy of the human race, seems to have been, in a sense, the force of evil opposed to Teotl.

The Aztecs and Nahuas in general believed in a life hereafter and that the souls of the dead went to one of three regions, the home of the Sun; Tlalocan, the residence of Tlaloc, the god of waters; and the dreary underworld called Mietlan, ruled over by Mictlantecutli and his consort, Mietlancihuatl. Soldiers killed in battle, prisoners sacrificed by the enemy and women who died in child-birth went to the home of the Sun, the men to wait upon him and to accompany him upon his daily journey to the zenith, where he was met by the women who formed his escort for the rest of the way. Those killed by drowning, lightning or any

of the diseases sent upon earth by Tlaloc or his consort, such as tumors and dropsy, and children sarrificed upon the altars of this god were transported, after death, to Tlalocán, a delightful region of mountains, shady trees and running streams. All those not qualified to go to the home of the Sun or the pleasure regions of Tlaloc were sent to Mictlan, situated, according to some authorities, in the cold and dreary morth; according to others, in the gloomy "navel of the earth," where they were forced to lead an aimless existence

By the Nahuas every phase of nature was personified and had its representative guardian spirit to whom offerings and sacrifices of some kind were made daily or periodically. Among these were household duties, of which every home had several, according to its class, condi-tion and position in society. The sacrifices to the national and tubal gods were attended to by a numerous and opulent presthood, who ruled in an autocratic manner and exacted heavy contributions for the maintenance of religious institutions and schools, the latter beam also under their complete control These being also under their complete control sacrifices, generally slaves or captives taken in war, were offered up upon the stone altars of the temples, the victims being thrown upon their backs and held down by attendants while the officiating priest ripped open the breast and tore out the heart of each and offered it, first to the Sun, and then to the particular divinity to whom the sacrifice had been made. The presentation of fruits, flowers, grain, animals and birds to the family gods was generally made by the head of the family or of the community house, when a number of families lived in one large building, as was often the case in Mexico, while sacrifices were made by individuals to those divinities who were believed to work in the interest of individuals Tezcatlipoca, a purely tribal divinity of the Texcocans, the most civilized and cultured of the Nahua people, had continued to gather to himself the powers of most of the other divinities, until, at the time of the Conquest, he was looked upon as a great divine ruler and creator and had become identified with the Toltec supreme divinity, the "Teotl." But he never ceased to be the tribal deity of the Texcocans Huitzilopochth, the tribal deity of the Aztecs, had become the great war-god of all the Nahuas because the military successes of the Aztecs had imposed him upon the other nations forming the confederacy. The large bodies of Toltees who remained in Mexico after the fall of the Toltee empire formed communities, the principal of which was at Cholula, where the presiding deity was Quetzalcoatl, also the fore-most divinity of the Zapotecas and, under the name of Yucano, that of the Mixtecas. The Toltees who went southward carried the worship of this deity into Yucatan and parts of Chiapas, Tabasco and Campeche, where he disputed sovereignty with the older deities of the native races. In the long ages of mythology, hundreds of races surged to and fro across Mexico and the great isthmus of Central America, leaving behind them remnants of their languages, tribal customs and mythologies. Thus we have a mingling of tongues, creeds and customs which has sorely puzzled the antiquarian, the linguist and the student of mythology. The destruction of the native codexes

and the undecipherable character of the remaining records in stone of the Mayas, Kiches and other highly civilized races of southern and eastern Mexico and Guatemala add greatly to the difficulties of understanding mythologies of the various races of Mexico

the various races of Mexico Roughly speaking, the Nahua, Maya and Kiche detties may be classed as gods of the air, to whom belong the culture deities, the lightning, the thunder and the storm gods; the sun, the moon and the planet Venus (the Evening Star) and the Supreme Creator; gods of rain, mist, moisture and the running waters of the earth; grain and other plant deities; special patrons of trades, occupations, games, sports, learning of all kinds, including astronomy, astrology, witchcraft, luck in gaming, medicine and the healing art. The functions of many of these seem to be inextricably min-gled and confused This is due partly to our inexact knowledge of the past institutions, history and mythology of the various races who mingled and blended on this great bridge of the continents throughout unknown centuries before history began. But remains enough have been left to show the complicated nature of the religious system of the Nahuas and other cognate races and to prove that they had advanced to a stage wherein ethical considerations played a very considerable part. The prayers addressed to their gods, the speeches to the sovereign and other officials about to take office, the advice of a father to his son and a mother to her daughter; the poetical effusions of the royal poet of Texcoco, Nezahualcoyotl, and many other like documents which have come down to us, are filled with evidence of the high ethical plane of Nahua religious thought at the time of the Conquest; for every occupation of society, all reasoning, every movement of life had their separate being within the shadow of the Nahua religion.

MYTHOLOGICAL CHARACTERS.

In the following account of the more important mythological characters most frequently met with in literature relating to Mexico, the territory in which each plays his part is, unless otherwise stated, the land of the Nahuas.

Bacabs.— In the mythology of Yucatan the Bacabs, the upholders of the heavens, were supposed to have their stand at the four cardinal points They were called Muluc, Cauac, Kan and Ix, North, South, East and West They were probably related to the four wind deities and to the four rain Tlalocs. The Bacabs were frequently represented in Maya sculpture.

Bat-God.—The Bat-God, Zotzilaha Chimalman, the "Dweller in the Bat's House"; a primitive divinity of the Mayas, the Zapotecas and the Mixtecas is met with in the Popol-Vuh, under the name of Camazotzo, where he plays a prominent part in the adventures of the hero gods of the underworld. He seems to have been a god of volcanic fire and to have been closely associated with earthquakes and the lower regions.

Centeotl.—A family name given to the maize gods. The female divinity, called Chicomecohuatl, "Seven-serpent," represented water as a fertilizer and was assisted by Chalchiutlicue, the consort of Tlaloc, in fertilizing

the youngest harvest and looking after it Under the title of Xilenon, "Green-corn-ear," she was the spurt of the green corn. As the earth goddess, she was called Tonacayohua, "She-who-nomishes." In this form she was one of the chief deities of the Totonacas, who crected to her, on the summit of a mountain, a great and imposing temple, to which pilgrims came from far and near. The name Centeoff was also given as a special title to both male and female deities. A summer testival lasting 18 days was held when the maize had attained its full growth. Ceremonial dances formed a part of this celebration at which a temale called Xalaquia, who represented Chicomecohuatl, danced with the test. Her face was painted yellow and ted to represent the tipe corn. On the last night of the festival all the women and the head men of the community joined in the "dance of death"; after which the Xalaquia was offered up as a sacrifice to Chi-comecohuatl. Not till the conclusion of this festival and its significant closing ceremony was it lawful to partake of the new corn

Chac was the rain god of Yucatán IIe is represented with a long tapir like snout through which it was believed he blew the rain out over the earth. He corresponds to the Tlaloc

of the Mexicans

Chalchihuitlicue, "the rain goddess," wore a dress of nebulous green, a blue crown decorated with green feathers and a collar of precious stones to which was attached a golden pendant, all emblematic of the varying colors of the water. In her left hand she hore a conventional water-plant, and in her right a vase surmounted by a cross, the sign of the four directions or points from which the wind drove the rain

Cihuapipiltin, "honored-women," the spirits of women who died in child-bitth, were closely related to the Moon Goddess. The moon had two tendencies, one actively beneficent, the other actively malevolent. The Cihnappiltin partook of this latter tendency. They afficied infants with certain diseases and they entered the bodies of weakly people, more especially the insane who were popularly supposed to be

governed constantly by their influence. Their temples were built at the cross-roads which they were said to haunt

Citlapol, "the Great Stat" (Venus), was the Lord of the Dawn, Tlahuzcalpan Tecutli This astral delay was thought to influence the events of life very greatly, so whenever the planet was due to rise, the people stopped up their chimneys to prevent the entrance of its harm-hearing light; whenever it reappeared on its circuit, captives were sacrificed to its image or its representation painted upon a column called Ilhuicatlán, "Place in the Sky," erected in the courtyard of the great temple of Tenochtitlán. Owing to the very special importance attached to the movements of this planet by both Mexicans and Mayas, its periods of revolution were carefully watched and recorded with great accuracy. As the evening star, this deity was said to fellow the sun on his journey to the underworld. He is represented as having a white body, symbolical of light, which was frequently covered with long, narrow, red stripes and over his eyes was a black mask, sometimes bordered with small white circles.

Coatlicue (Coatlatona), "She with Dress

of Serpents," was the Aztec goddess of flowers and probably identical with the tabled mother of the god of war of the Aztecs. She was the patroness of gardeners who, in the early spring time, offered her parlands of flowers

Ehchuah, the "Black God," was the patron divinity of merchants and cacao planters in

Yucatán

Gucumatz, "Green feathered-scrpent," the great Maya Kiche culture detty, the equivalent of Ouetzalcoatl, of which the name is a literal translation

Huechaana, one of the two Zapoteca creation deities, was the creator of all men and fishes; Cozaana was the creator of all beasts As the story relating to these two creator divinities is also told in another form by the Mix-teeas, and as the earle and the snake play a prominent part in this latter form of the myth, it is probable these two Zapoteca deities were closely related to the culture gods of other

Mexican peoples

Huchneteotl. "Oldest of the Gods," the fire deity, was also called Nintecutli, "Lord of the Year," while he was renerally addressed as "tata" or our tather. He was represented with a black face and a red body, typical of fire. He wore a headdress of green teathers, a sign of royalty or divinity in pre Columbian Mexico. and on his back he bore a yellow seipent, symbolical of his own special functions and of his relationship to the god, of the an His connection with the sun, the tather of all heat, was shown by a golden murror. As Xintecuth, he was a very much revered household god to whom an offering of drink and bread was made by every Mexican on tising in the morning. It was before his idol that the new fire was kindled every year. It was thought to be necessary for the existence of a new born infant that a fire should be kept burning for four days in honor of its arrival and as a sign of gratitude to the Lord of the Year.

Huitzilopochtli (Mexilli), "Humming-bird's Feathers on the Left (leg)," the tribal deity of the Aztecs and their great god of war. He was the son of the Sun God and of Coaffiche (Coatlatona), "She with dress of serpent," the Aztec goddess of flowers and the reputed mother of the gods. He was born with a shield in one hand and a blue spear in the other, fully armed for war; and he proceeded at once to the extermination of his sister and his brothers, a fabled tribe of denu-gods, who had conspired to kill their mother. He pursued them four times around a mountain, killing many. Others were drowned in a near-by lake, while a few surrendered and made peace Huitzilopochtli usually wore a headdless of humming bird's feathers; in his left hand he carried a shield and in his right four darts. On account of his prowess in war and of the prominence of the Aztecs at the front of the Mexican confederacy, he was the religious head He had power of the Mexican priesthood. over all growing things; the feather markings of his shield were in the form of a cross composed of dots, thus connecting him with the Tlalocs; his face and his limbs were marked with stripes of blue, and he was scated on a pedestal of blue, at each of the four corners of which was a scrpent. Across his face and his forehead, from ear to ear, was an azure band, all typical of his dominion over the sky, where, as a tribal deity, he ruled as the god of lightning, of thunder and of terrifying winds.

Huistocihuatl was the protecting goddess of salt and salt-makers throughout the Aztec Empure, where the gathering of salt from the salt deposits along the low coast-lands was a busi-

ness of great importance

Hurakán, «He who hurls below,» the Maya-Kiche god of the storm, of wind in motion, was accompanied in his work by violent manifestations of nature by three assistant deities, (Lightning-track) and Chipi-Cakulha (Lightning-flash) Hurricane, Spanish huracán, is supposed to be derived from the name of this

Itzamná, «Dew of clouds and heaven,» father of gods and men, the tutelar divinity of Yucatán, and more especially of the Itzaes, was credited with possessing most of the powers of Quetzalcoat, of ruling over more or less the same phase of human life and of performing more or less the same acts in behalf of humanity, and all evidence tends to show that he was but an earlier peninsular form of the great American culture myth. He was the universal life-giver and hence the pation divinity of birth and of growing vegetation was allo the culture god who was popularly beheved to have taught the Itzaes the civilization they had acquired. He was the fabled founder of Itzamal, and in his capital, in semi-historical times, was a magnificent temple dedicated to his worship,

Ixthiton, "Ife of the Black Face," the god of medicine and healing, was also addressed as Tlatetecuin, the "earth-digger." He was said to be brother of Maculyochill Sick children were carried to his temple to dance, and recite prayers and incantations, after which the priests gave them a special medicine contained in *tlitatl* "black-water jars." If the patient got better, the image of the god was taken to the house of his residence, where offerings and ceremonial dances were made in his honor.

Kinich-Ahau, "Lord of the Sun's Face," the Sun-god of Yucatán, presided over the North. He was also called Kuuch-kakmo, «Sun-bird» and Aiaia, «Fire-bird» The figure of the Sun is frequently represented upon ancient buildings in Chiapas, Yucatán and Guatemala; and in the latter country certain Indian tribes still wear, on festive occasions, a gala dress with a great, yellow sun depicted on both front and back of the garment. They call themselves "Children of the Sun."

Kukulcán, «Feathered-serpent,» a literal translation of Quetzalcoatl, was the great Maya culture god. He is said to have been the first king of Mayapán, just as tradition makes Quetzalcoatl one of the kings of Tula

Macuilxochitl, «Five-flower,» Xochipilli, «Source-of-flowers,» was the patron of luck in gambling. His worship was general throughout the Aztec Empire and nations to the south of it; and he was held in high honor among the Zapotecas and Mixtecas At a yearly festival dedicated to him, offerings of cakes, animals and human beings were made and ceremonial dances performed in which the people, richly dressed, took part.

Metztli, «the Moon goddess,» Yohualticitl, «Lady of the night,» was patroness of harvest and fertility. The Zapotecas and Nahuas beheved that women stood in a very special rela-

tionship to this deity

Mixcoatl, «Cloud-serpent,» the Aztec and Otomi god of the chase, was sometimes represented as a deer or a rabbit He carried a sheaf of arrows to typify his office On the site of a famous ancient shrine of Mixcoatl stands Mixcoac, the «city of gardens,» one of the most popular suburbs of the Mexican capi-

Nanahuatl, «Lord of lepers and those afflicted with skin diseases," is always connected with the moon, and diseased persons under his protection were believed to be sacrifices pecularly acceptable to her, for whose service they were set apart. The moon goddess was intimately connected with the art of healing and she also took a special interest in lepers

Napatecutli, «Four-times-lord,» protector of mat-makers, one of the numerous rain gods, was one of the ministers of Tlaloc. He presided over the low, swampy lands where the reeds grow from which mats are still exten-

sively made in Mexico.

Omactl, «Two-reeds,» Nahua god of festivities and rejoicing, whose image always presided over the feasts of the well-to-do, ceremonially eaten in the form of a great bone of Indian coin meal at every festival. The idol had a recess in the region of the stomach into which provisions were put. The image wore a paper coronet and a cloak fringed with flowers and carried a sword

Opochtli, «Left-handed,» Aztec god of fishing, also called, in Chalco, Amimitl, was said to be the inventor of the fish-hook, line and spear and other means of catching fish. The similarity of his name with that of the Aztec god of war would seem to connect him with the latter, especially when it is remembered that Huitzilopochtli was the tribal god of the Aztecs when they were mainly fishers.

Sun-god, the supreme deity of the Toltecs. played an important part in the mythologies of the Nahuas, Itzaes, Mayas, Zapotecas, tecas and other races of Mexico and Central America. He was called Ipalnemohuani, «Heby-whom-we-live» As the god of warriors the priest and nobles claimed descent from him. His golden image was hung upon the wall of his court where the first rays of the rising sun fell directly upon it. Human sacrifices were offered to the Sun, whose strength was sustained by the blood of these victims, otherwise he would not be able to continue his journey through the sky. Even the hearts of the captives offered to Huitzilopochtli and Tezcatlipoca were first presented to the sun.

ico, Central America and Peru were erected to the Sun-god. Tepeyollotl, «Heart-of-the-hills,» personification of the echo of the mountains, was one of the nine attendants of the night and lord of the 13 days following the flood, in which no sacrifices were good, and during which the feast of the jaguar was held. He was a southern deity highly honored among the Zapotecas and the Mixtecas and bordering

Some of the most magnificent temples of Mex-

tribes.

Tezcatlipoca, «Fiery-mirror,» the tribal deity of the Colhuas, was a god of the winds and the tempest and the giver of breath and hence of life. In the Nahua legend he is, the

opponent of Quetzalcoatl whom he deceived and induced to give up his work upon earth and return to the home of the Sun. In the capacity of doomster he was called Yaotzu, "The enemy," and Nezahual pilli, "Hungrychief. As the spirit of the ever-youthful tempest, he was address d as Telpochtli, "Youthful-warrior", and as the spirit of the night, he was called Yoalli Ehecatl, "Night-wind" Benches were placed along the highway for him to rest on after his exertions of the night. He was a god of fortune and of fate. As the detty to whom worship was obligatory, he was known as Monenque, "Claimer-of-prayer" and as such he had special power over plague, famine and threatened danger to the people, the state and the human race. He had dominion over life and death. He carried a whistle, symbolical of the noise of the wind, as a warrior god he was aimed with dart and shield. To his legs were fastened small bells and in his left hand he held a golden mirror, in which he saw reflected all that passed upon earth

Tlaelquani, the Mexican deity whose province it was to forgive or eradicate sin possessed a dual nature. She was the patroness of desire and luxury, and the confessions made to her were restricted to sins against morality. She was mediator between the penitent and Texcatlipoca, the "Most Powerful God," the "Protector of All" and the "Searcher-out-of-evil." The penitent, in the presence of the officiating priest, lighted a sacrificial fire and burned incense to the detty to whom he confessed his sins and addressed his prayers for

forgiveness.

Tlalocs.—The Tlalocs were masters of the liquid element in all its forms. In the dwelling place of the Tlalocatecuth and Chalchutheue, Lord and Mistress of the Tlalocs, there were four ponds of water, the first of which aided germination, the second of which withered the seed, the third of which froze it and the fourth of which ripened it. These two detites were, according to the myth, created after the appearance of the last sun. Tlalocatecutli was called the "Fertilizer of the earth," and the "Protector of Temporal Gods." He and his consoit lived on a high mountain among the eternal clouds, and from there he sent his visitations of water, mist and fog. Hence his images were erected on high elevations such as hill tops and mountain summits. The characteristic sign of Tlaloc was the cross, which represented the four points of the heavens from which the winds drove the rains. The representation of Tlaloc in the Mexican manuscripts, is painted of water; and he carries a spiral-shaped wand of gold, typical of the lightning.

Tlapotlazenan, the Aztec goddess of healing and the discoverer of turpentine as the base of certain native ointments, popular at the time of the Conquest, is credited with having originated most of the medicines in use through-

out the Aztec Empire

Uayayab, "He by whom the Year is Poisoned," was the Maya deity who presided over the five unlucky days at the end of the year. His image was carried out of every village and town and left outside during the days of his influence in order that he might not poison the new year.

Votán, the fabled civilizer of the ancient

people of Chiapas, was closely related to the culture gods of the other races of Mexico and Central America

Xipe was the god of vegetation and the sowing time and his general characteristics are those of the culture derties. He was considered a tribal equivalent of Tezcatlipoca and, under somewhat varying forms, he was worshipped throughout the Aztec Empire and among the nations bordering upon it to the south. He was connected with the Moon, and the gold and silversmiths regarded him as their tutelar god, He was called the "flayed one," because at his festival the skin was removed from each human victim sacrificed to him and worn for 20 days by the devotee turnishing the sacrifice In Tenochtitlan, where his festival was one of the important religious events of the year, he appears to have been looked upon as the god of human sacrifices. The monarchs and chief warriors of the Aztec Empire, when actively engaged in war, frequently donned the classical costume of Xipe.

Xolotl was a southern deity of lightning; and in the Aztec calendar he ruled over the 15th week and the 17th day sign, but as the Mexican calendar was borrowed from southern nations, and as the nature of this exotic deity was not understood by the Aztecs, he always remained to them a strange, mysterious figure He was the Lightning Beast of the Mayas and cognate tribes, among whom he was a deity of the air and the cardinal points or the four directions of the winds.

Xpiyacoc and Xmucane, Father-and-Mother gods, are the Maya Kiche equivalent of the Nahuatl generators. Ometecuth and Omechuatl They were endowed with creative power.

Yacatecutli, "He who guides," was the Mexican god of commerce and trade, and the Aztec merchants held in his honor, twice a year, great lestivities during which elaborate banquets were held and sacrifices were offered to the god. The traveler's staff was his particular symbol, and to it prayers were made and offerings of flowers and incense proffered

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13. ART. Pre-Columbian Art.— When Cortes first visited the shores of Mexico in 1510, he was surprised at the skill displayed by the Indian artists, who rapidly drew excellent sketches of his ships, his men, with their clothing, their arms and their horses, and forwarded them, by rapid counter service, to Montezuma in Tenochittlan. This was the first contact of European and Mexican civilizations which was destined, in the near future, to produce the greatest and most characteristic of all the colonial art in the lands under the domination of Spain, during the 16th, 17th and 18th centuries, an art which is neither native American not Spanish, but a mingling and blending of both in a way that has made it truly Mexican

Mexican Indian art before the Spanish Conquest was mechanical, industrial, commercial and graphic. It was pictorial in the sense that all lineroglyphs and pictographs are pictorial, but it had not advanced beyond that stage in which it was still almost altogether a useful art. Mexican paintings, drawings and sculpture were the handmaidens of religion, commerce, trade, history, geography, literature and science, and so intimately were they all connected with one another that it is impossible to understand one without comprehending the others. Yet all had their influence upon the new art that sprang from the meeting of the two currents of thought, from the Old World

and from the New. The pre-Columbian inhabitants of Mexico were artistic in varying degrees, and the artistic sense still shows itself strongly in their descendants Poets, orators, decorators, musicians, literary men, artists, penmen, all bring to their work a depth of feeling, a strong sensitiveness, often a strange vagueness, indicative of the artistic mind. The untutored, untutored Montage postery cultured Mexican peasant produces pottery, artistic in form and decorated in pleasing colors and designs. He readily imitates the furniture imported from the best art centres of Europe and the United States; in many parts of the republic his weaving, his designs on woolen wraps and blankets and his pictorial featherwork are the delight of art collectors art sense creeps out in the most unexpected The rude Indian from the hills surprises us with the artistic way in which he has arranged the flowers he offers us for a few cents; he delights us with the baskets of his own manufacture on which he has depicted, in a really graphic manner, scenes from the national customs; with figures modeled in clay and painted in natural colors, depicting, in a most vivid manner, local types, customs, dress, trades, occupations, sports and pastimes Generally the humble, diffident, barefooted, brownfaced figure, dressed in wide-cut, cotton pantaloons and shirt of the same material, who

offers his wares for sale, is their creator; for there is little retail business among the Indian population of Mexico outside the towns and villages All this points to an artistic past; for the condition of a given race at a given time is the result of its ethnic development.

Indian Feather-work.—The most characteristic of the pre-Columbian Mexican arts was the native feather-work, which called forth the admiration of the art lovers of Europe. The Mexican artists produced wonderful pictures by matching, with infinite patience and consummate skill, small particles of feathers, which they gummed to a background of woven fabric. An enthusiastic witness, bearing testimony shortly after the Conquest, says: "They (the Aztecs) painted in feathers, producing the living colors of nature"; and one can well believe this statement; for the untutored, ignorant Mexican Indian still handing down the traditions of his fathers imitates in feather mosaics national scenes, customs, occupations and sports, in so realistic a manner that, at a short distance, his work seems painted

These feather artists were in all their glory at the time of the Conquest and they continued to flourish in Mexico for almost a century afterward. Their art was known to all the Nahuatl peoples; and centuries before the Norman Conquest of England, the Toltecs had developed it to such an extent that immense pieces of feather draperies representing mythological and other scenes were used as hangmgs with which to cover up completely the walls of certain apartments of the great temple at their capital, Tula, dedicated to Quetzalcoatl, god of the winds. Three different sections of the temple were decorated in this way, in each of which a distinctly different color effect had been produced. Feather tapestries were used as hangings for the palaces of the Aztec emperors and nobles; and they were, competent witnesses assert, the equal of the best woven or painted wall hangings made in Europe dur-ing the 16th century With the boldness born of long practice and acquired skill, Mexican feather artists attempted successfully to produce in feathers the works of the most famous Italian and Spanish artists of the loth century. The converted Indians "painted" in feather mosaics the favorite saints of the Catholic Church; and their work, which was encouraged by the papal authorities at Rome, became immensely popular in Europe

The most brilliant plumage of the birds of the tropics were sought out with which to imitate the colors of nature Shortly after the Conquest a Great Christian-Pagan feather mosaic was sent to Pope Paul III; and so excelent was its workmanship that his Holiness would not believe it had not been painted in oil until he had tested it by examining it closely and carefully This work so impressed him that he expedited a bull, in 1537, rehabilitating the Indian races of Mexico, the greater part of whom had already been reduced to slavery in the 16 years that had elapsed since the Conquest.

Feather-work mosaics and other forms of ornamentation and decorative feather art entered into the very life of the Mexican people prior to the Conquest All the land of the Aztecs was searched for artists who showed

special talent in this difficult and exacting kind of work. Children were trained from childhood in special schools of art and their masters were themselves the most skilled artists of the land. Picture-making was, however, but a part of their instruction. They were schooled in the art of making princely garments for the emperor, the princes, the nobles and the priests and the noble ladies of the court, so highly was the art esteemed that the sovereigns themselves considered it high honor to be classed as even passably good feather artists. Clazonzi, king of Michoacan, next to Texcoco, the greatest centre of feather-work, enjoyed the distinction of being the best artist in his kingdom, and he was mordinately proud of his skill, probably more so than of his toyal honors.

The Feather Market .-- The work of the feather artists developed a great commercial business for the Aztec merchants highly appreciated feathers were bought and sold daily in the market, where they were so esteemed that they brought literally several times their weight in gold. They passed as currency among the Aztees and neighboring nations, and nothing more valuable with which to pay the ransom of captured princes or conquered kingdoms existed than they. Captives who were good feather artists brought high prices in the market and, for this reason, then lives were spared from the sacrificial altar Merchants devoted themselves especially to the buying and selling of ait teathers; and the chief purchaser for the court held the title of purveyor of feathers to the sovereign Men of fine artistic tastes were trained to sort feathers and to arrange them into classes according to their color, fineness, ment and mar-ket value They held office under the government and were highly paid officials.

Throughout the Aztec Empire, very stringent laws protected the birds from which the most esteemed feathers were obtained for the work of the artist; and the quetzal, the most highly valued of these favored ones, grew into a sacred bird, and as such his teathers could be worn only by the king and the high priest, both of whom represented their gods upon earth. The Aztec monarchs maintained great aviaries in the capital where birds of rare plumage were reared with the greatest care; and the stealing of feathers from these royal aviaries was pun-

ished with death

Centuries of training in art work of such an exacting nature as feather mosaics developed the artistic sense strongly in the artist caste of the Mexican people; and it is not at all strange that this ability began to show itself in a new way shortly after the Conquest, when Spanish friars and missionaries, many of them no mean artists themselves, began to teach the principles of European art to the pupils of the Mexican convents and schools, nearly all of whom belonged to the native nobility or to families dedicated to trade, to the arts, the crasts or to literature and music, all of which were held just a little lower than noble rank. The merchants who brought the precious feathers to the capital and distributed the manufactured product to the furthermost confines of the empire and to the countries beyond formed a guild unto themselves, over which presided Quetzalcoatl, the first half of whose

name is formed from the "quetzal," the sacred bild and the symbol of divinity. It is still preserved upon the coal of aims of Guatemala But the very enthusiasm with which the natives threw themselves into the new learning called for the restraining hand of Spain, which gradually shut out from them almost every field of endeavor except that of painting, or so controlled the workmen that the Spainards got the profits and the glory from every accomplishment

Hispano-Indian School. Pelioes have come down of a school of Indian painters, who flourished during the first 50 years following the fall of Tenochtitlán, in Texcoco and Cuautitlán, both towns near the capital. Under then Spanish masters they had learned to paint the saints and to represent graphically biblical and religious legendary subjects. They painted the pieces of "escenario" necessary for the production of the miracle plays and other dramatic representations by means of which the Christian Chirch attempted to teach the natives the principles and dogmas of its faith. Little or none of the art of this period has survived, with the exception of one putine of international lame which, on account of the material on which it is painted and the artist's treatment of his subject, almost certainly belongs to this early Ibero Indian school. This is the famous picture of Our Lady of Guadalupe, which made its appearance within eight years after the fall of the City of Mexico, or before 1530. The religious legend asserts that the picture of the patroness of the Mexican people was miraculously made by the tilma or shouldercovering of a poor Indian named Juan Diego: Instorical investigation has shown that it was painted for a miracle play given in one of the new convent schools in the City of Mexico very shortly after the Conquest. This picture shows very considerable artistic talent, which is neither Spanish nor Indian, but a blending of the two. The drawing is bold and free and the coloring anticipates, by three quarters of a century, the soft, pleasing tone of the artists of the first great Mexican school

The demands of the ever tireless, ever active church upon the Spanish born and native artists alike were insistent and persistent and many hundreds of canvases belonging to the first three quarters of a century following the Conquest were produced at the wave of her miraculous wand, for the churches, schools, convents, monasteries and episcopal palaces, that sprang up, phantom like, throughout the land Spanish artists of note were brought from old Spain to superintend the work of the native artists in New Spain; and they all attested the wonderful aptitude of their pupils.

Early Spanish Masters. One of the earliest of these masters was Rodrigo de Cifuentes, who arrived in Mexico shortly after the Conquest. He appears to have had the patronage of the conqueror, Cortes, of whom he painted several portraits. The picture of the baptism of Magiscatzin in the church of San Francisco, Tlaxcala, is said to be his work. He also painted the portraits of the first audencia and also of Doña Marina, the Indian querida of Cortes, about 15%.

Andrés de Concha, who arrived in Mexico during the time of the first viceroy, and his

Indian pupils enjoyed a high reputation as interior decorators of churches and convents and they were often called to interior cities to do decorative work. The group of paintings over the high altar of Santo Domingo Church in Yanhuntlan, Oaxaca, is the work of Concha, whom Padre Burgoaque calls the Apeles of the New World

Arteaga, another master painter, is said to have reached Mexico City three years after the Conquest and to have been very active in building up the Indian school. There was one of his pictures, 'The Visitation of the Virgin,' in the old church of Santa Teresa about the middle of the 18th century; and it is probably

still in existence

Simón Pereyus, a Flemish artist, painted the pictures for the main altar of La Merced church, and a 'Virgin with a Child' in the National Academy is supposed to be his work. Francisco Zumaya and Francisco Morales were his contemporaries. Alonzo Vázquez, who was somewhat younger than Pereyus, was also active as an artist and a teacher. The 'Assumption' and the 'Redeinption,' in the National Academy are credited to him. Juan de Rua, one of Vázquez' pupils, has left a fairly good series of scenes from the life of the Virgin, in the church of San Francisco, Cuautinchán, Puebla

Pupils of these masters, also famous in their Bernal Díaz del day, have come down to us Castillo, the first historian of the Conquest and one of the soldiers who took part in it, praises lughly three Indian painters and lapidaries, Andrés de Aquino, Juan de la Cruz and El Crespillo whom he likens to the best artists of Italy and Spain in his day Alonzo Vázquez and his pupil Juan de Rua, already mentioned, are credited with having introduced correct European methods of art into Mexico; and they and their school undoubtedly paved the way for the flourishing and excellent school of artists of the 17th century. In fact we know, by the results already obtained and by the reports that have come down to us, that there had been a wonderful quickening of life in all the arts between 1521 and 1600. This was but a re-echo of the animation in art in Spain hersell, in Italy, in the Netherlands and throughout the vast Spanish empire in America Industries, arts, trades, commerce, mining, agriculture took on a new existence, and Mexico City became the first metropolis of the New World, and the centre of this new-horn progress in America The genius of the Spaniard for organization laid its hand upon the immense domains of the Moctezumas and that hand was never lifted for 300 years, during all of which time the artistic life of the luxurious capital of New Spain was ever in touch with that of the mother country With the coming of the first viceroy in 1535, this activity of the favorite colony increased A year later printing was introduced into Mexico City; and the court of Spain began to take a peculiar interest in the educational and artistic development of her favorite colony. To this interest and the strong encouragement which accompanied it is due, in part at least, the cagerness with which the native artists worked The hundreds of Spanish and Flemish paintings and the thousands of art prints that flooded the land, affording means of study and advancement not before possessed by the natives, made

possible the successful school of native art with which the 17th century opened.

Influence of Spanish Art .- The discovery of America and the sudden vast treasures that poured into Spain from over seas, the long struggle with the Moors, of Christianity against Mohammedanism, the rise of the Catholic Church and the birth of the temporal power of the popes and the consequent wars necessary for the maintenance of the powers and conditions thereby engendered, were forces that worked mexorably to the shaping of all Spanish art, which had its origin in the Church and received its inspiration and encouragement constantly from the same source Italy was the great mistress of Latin art and the teacher of Spain, when she came to lay by her Gothic traditions, but Spanish art traveled a road distinctly different from that of Italy In Spain art was very largely influenced by the traditions and dogma of the Christian Church, which continued to shape it to its ends and control its execution In Italy it was classical and it ran after strange gods which also shaped it to their ends. In Italy art was free, unrestrained; licentious the more orthodox Christians contended. In Spain it was bound by the canons of Church law, by the restrictions of ecclesiastical councils and by an intense fanaticism and a devotion to the Christine doctrine and legendary lore unknown in other countries. Upon it rested the heavy hand of asceticism and the sombre shadow of the Inquisition, a peculiarly Spanish Yet the artists of Italy exercised institution an all-powerful influence upon those of Spain, for more than two centuries of changes varying always within a certain defined and restricted area of activity. The ascetic Spanish taste did not change its Gothic attitude, when under Italian influence it changed its fashion in painting While the Italian gloried in the nude of Greek and Roman art, the asceticism of Spain covered up the parts of the human body, wrapping them about with draperies, too often much less artistic than the freer treatment of While the Italian artist boldly attempted Italy to depict the human anatomy in all its nude or semi-nude and almost wholly Pagan attitudes, the Spanish artist was forced to resort to suggestion to convey lasting impressions of what his asceticism had forced him to hide from Thus, while the Italian artist, by his sight free and unconventional use of the nude, obtained brilliant sculptural effects, the Spanish artist, in his efforts to reach the same ends, while draping his figures, became insensibly a colorist. So Murillo, the greatest of all Spanish colorists, has always been Spain's most popular artist

It was therefore natural that, of all the Italian schools, the Venetian suited Spanish taste best; and of all the Venetian artists, Titian appealed most to the Spanish attitude of mind toward art. The brilliant coloring of the Venetians, their indistinct drawing and their neglect of the antique appealed to the religious ideas of the Spanish artists. So Titian became the motive spirit in the renaissance movement in Spanish art. A powerful but secondary influence was exercised by the Hollander, Antoine More, who, as a portrait painter, was little inferior to Titian. Vandyck also contributed to the making of Spanish art traditions. But the atmosphere of Spanish life

and the fervid religious spirit of the land twisted all the foreign traditions of art and of schools to their own way of thinking and of viewing life and of acknowledging its obligations, with the result that Spanish art grew to be a thing apart from its own Gothic traditions, from the classical style which it imported from Italy and the rigid Venetian school to which it very strongly inclined. The sombre, ardent, fanatical Spanish mind worked over all these materials and from the working sprang a new art which was peculiarly Spain's For more than two centuries this strange semi-artistic, semi-ascetic spirit brooded over Spain, producing the magnificent creations of Vargas, Morales, Sanchez, Coello, Joannés, Beceria (the great teacher), Fernández el Mudo (the "Titian of Spaui⁹), Cotán, Zubarán, Pereda, Velázques (the incomparable portrait painter) and Murillo, the superb master of color. And they all had, through their art which found its way across the Atlantic, their influence upon the artists of the colonies in America. Yet we look in vain in treatises on art for any adequate presentation of the work of the American artists or of the vast output of excellent pauning by the Spanish colonies in America, all of whom followed the traditions of the mother country, modifying them more or less according to their several environments and local influ-Yet for more than two centuries, the followers of the Spanish masters in America, enthusiastic students of their creations, tireless workers, covered the two continents from San Francisco to Buenos Aires, from Cuba to Chile. In every provincial capital industrious schools of art existed; and all followed the traditions of Spain At the exhortation of the Church and the insatiable demands of the dealers who made a business of shipping pictures over seas to the colonies, the Spanish artists at home redoubled their efforts, and a constant stream of canvases poured forth from their hives of art industry. No church, convent, college or university in the vast domains of Spain beyond the sea was so poor as not to possess at least one treasure from the art centres of the mother land. When the ecclesiastic dignitaries of Spain wished to show honor to some institution of the colonies, they forwarded to it a painting or other work of some noted Spanish artist. The king, the emperor and the nobles showed their favors in the same manner. New Spain, the favorite namesake of the mother land, became thus a storehouse of Spanish art. These treasures storehouse of Spanish art. These treasures were to the Mexican artists what the pictures of Italy and Holland were to the artists of Spain. They copied them, they imitated them and they built upon them a Mexican art which, while it followed the traditions of the Spanish school, was yet, in many respects, distinctly Mexican, as the character of the Mexican people and their environments are distinct from those of Spain.

For more than 200 years the Spanish artist attended to only one of the manifestations of nature, that is, man and his relation to the deity and to heavenly manifestations. Mountains, streams, occans, the sun, the moon, the beauty of the night and the glory of the day meant nothing to him except when they helped him to depict his deity, his saints, his religious traditions, his dogmas and his miracles. In all this the Mexican artist followed

his masters, faithfully, conscientiously, earnestly. But the spirit with which he executed his tasks was noticeably different from that of his teachers. The stern, harsh character of the Spaniard is depicted in the hard lines of even the best of his artists up to the time he began to leave behind him the vivid memory of his terrific religious wars against the Moots When the "heathen" of the New World had been conquered and placed beneath his heel and he had filled with churches, shimes and colleges then yast domain, when he had lifted from his shoulders the burden of strile in behalf of altar and hearth, then the Spanish artist began to cover up the harsh lines of Gothic and early Venetian art traditions and feelings, thus engendering an attitude of mind that made possible the wonderful analytical representations of Velázquez and the brilliant coloring and softening effects of Murillo

But as the Indian character was different

from that of the Spaniard, so long before Spain had deserted her ancient Gothic traditions completely, the Mexican artists had become noted for "the gentleness of their art". More than nall a century before Murillo produced his best work, which marks the middle and last periods in his progressive development, the old Mexican master. Beltasar de l'chave, had painted characteristically native pictures which found their way to the foremost shirnes of the country and to many of the Spanish colonies in America where, not infrequently, they were represented to be the work of noted Spanish artists. His reputation extended even to Spain where he was praised by the foremost painters of the day, a great distinction for a colonial artist, in an age when Spain was very jealous of all honors given outside her own pennsular domain. But greater honors have come to Mexican artists since Echave's day; for the works of her masters have been gathered up from all over the land and taken to Europe where they have been passed off as original works of Spanish masters of the 10th, 17th and 18th centuries Thus Mexico has lost countless treasures of native art. Every revolution has helped to deplete her works of her greatest artists. The sacking of cities, the plundering of churches, convents and private houses, the rapacity of native owners of art treasures and foreign speculators and often the very ignorance of the revolutionary leaders have conspired to deprive her of the living records of her prominence in art over all the other nations of the American continent. Some of the revolutionary leaders have been accused of cutting from their gilded frames the great old canvases of the churches and convents and turning them with the paint side upward to serve as tents or shelters from the tropical sun for themselves and their brother officers Valuable pictures of native and toreign artists were not unfrequently slashed with swords or knives or otherwise mutilated or destroyed. But the greatest injury done to native art was the result of the ignorance of the treasures possessed by the nation and the consequent neglect to care for it. Ancient pictures of merit were replaced by others of lesser value or historical interest by some local artist in vogue at the time and the dispossessed pictures were relegated to the parret where they were left to moulder in the damp and darkness and to become worm-eaten Guardians of the treasures of the church, tempted by cupidity, often sold their finest pictures, which not in-frequently passed to foreign lands there to cease to be Mexican in name at least

And yet no other country on the American continent continues to possess anything like the amount of really artistic pictures of its ancient artists as that still retained by Mexico Lovers of art in Mexico have begun to recognize the high standard of excellence attained by their best masters of the 17th and 18th centuries; and the market value of these pictures has usen rapidly during the present century this is an added danger to the retention of the native art at home

The School of Echave.— The founder of the first Mexican school was Beltasar de Echave, the elder, whose first existing picture dates back to 1601. He had already become a famous artist by 1600, years before Velázquez and Murillo flourished in Spain His drawing and conceptions are very much better than anything produced by his contemporaries; his forms and faces are true to nature and his style is devoid of affectations and concerts Other Mexican painters have surpassed Echave in execution, in perfection of style, in the observation of the technical laws of art, but none have approached him in fertility of invention and depth of thought. In fact he was philologist, critic and writer as well as artist Ilis wife, La Sumaya, who was also an aitist of no mean ment, is said to have been his teacher in the art of painting; and a meritorious picture of San Sebastian in the cathedral is said to be from her brush. Echave and his wife both belonged to the Spanish school of Joannes, the best artist of his day and superior to all who preceded him in Spain The work of Echave is unequal, but the best of it shows a genus superior even to that of his master, whose praise all Spain sang in his day Though his style was finished and somewhat labored, like that of the artists of his epoch, yet his industry and application were so great that he left very many pictures varying from huge canvases to small tablets, which, before the amortization of church property, were to be found in many of the churches of the capi-tal and in many of those in the interior Among his existing pictures are 'San Cristobal) (1601), which stood over the great door of the Franciscan monastery, 'San Ignacio' (1610), and the 'Martyrdom of the Virgin of Colonia, hoth of which were also in the same edifice; 'San Francisco de Paula,' in Guadalupe church; 'Martyrdom of Santa Catarina' (1640), in Santo Domingo, and 'Santa Cecilia,' one of his best, in the Profesa. In 1608 he painted 15 tablets for the altar of the old church of Santiago, Tlaltelolco

Luís Juáicz, a contemporary of Echave, shows, in all his works, strong individuality His figures are excellent, his exposition strong and true, but his execution is frequently unequal Many of the heads of his figures, to which he paid much attention, are as fine as anything produced by the Spanish masters of his day. Juárcz' style is free and less labored than that of his master, Echave, to whom he is but slightly inferior. He was very prolific and this, coupled with his popularity, made his execution, like that of Echave, very unequal.

However, his conception is always bold and his coloring good His work is more realistic than that of Echave. Most of his known pictures are in the Mexican National Academy.

José Juárez, who was active from 1642 to 1698, followed the traditions of Echave and came the nearest of all the Mexican painters to attaining to the excellencies of his master, to whom he was but slightly inferior in expression and the depicting of religious feeling He had exceptional talent but, owing to the speed with which he was forced to do the vast amount of work that came to him, he often became careless Rafael Lucio, an excellent critic, says of Juárez "I have seen angels of his that seemed to belong to the very best period of Italian art. His style is elevated and even more realistic than that of Luís Juárez; his drawing and execution are good, and in his grave and harmonious coloring there is a noble severity. His figures are free and flexible and show strong individuality, while his canvases are generally lit with the animation of life, partially due to his masterly grouping of figures, his excellent coloring and his decided tendency toward that softness and simplicity which distinguishes the school of Echave There is a noted depth and contrast in his coloring. A number of his best pictures are in the Mexican National Academy

Sebastian de Arteaga, a priest and notary for the Inquisition, was another excellent artist belonging to the school of Echave. He displays vigor, power, freedom of movement and a boldness unknown up to his time in the Mexican school. His style is less finished than that of his great contemporaries and his coloring is not so good; but his figures of the Virgin are graceful and beautiful He is content, too often with carefully executing his central figures and leaving his accessories but poorly done. His style is truer to nature than that of the elder Echave but he lacks the grace of the old master and that simplicity which distinguishes the early Mexican painters In his work there is a dash and a freedom with the brush that might have made of him a really great artist had he given his whole attention to art; but he had too many other occupations to permit him to work out his own salvation. In the Mexican National Academy there are three notable pictures of his 'The Betrothal of the Virgin,' 'Saint Thomas Putting his Hand into the Wound of the Christ' and his 'Adoration of the Wise Men'

Beltásar de Echave (1632-82) the younger, son of the elder artist of the same name, developed a style very different from that of his father. He was bold and vigorous but too impatient to finish his work well. His drawing is frequently faulty and his execution reminds one of Arteaga, of whom he was a contemporary. His compositions, however, show plenty of life and a strong sense of the dra-matic. Although he was a follower of Arteaga, he foreshadows the new school which distinguished the following century. His 'Entombment' is one of the most notable works of the old Mexican school Two other notable pictures of his, 'The Triumph of the Church' and 'The Triumph of Faith,' are both in the Puebla Cathedral, which also possesses several other pictures of his 'The Savior,' 'The Martyrdom of Saint Peter of Veronica,' 'The Four Evangelists, in the Mexican National Acad

emy are also good pictures

The latter part of the 17th century, which
Arteaga and Echave the younger influenced strongly, was very active in art. Juan Correa, whose drawing and coloring are excellent, painted much. His work shows freedom of execution, a firm handling of the subject and an easy swing of the brush, but his tone is often oppressive. Six great paintings of his are in the cathedral. With Correa begins a period of decadence in Mexican art. But he was a great teacher and he introduced new ideas into Mexican art which were destined to become the most noticeable motive power of the new school made famous by Ibarra and Cabrera, Ins two most noted pupils. He was lavish in his employment of figures, loved immense can vases and aimed at grand and imposing scenes Ilis grouping is artistic and the general tone of his picture is good. His characters show sin cere feeling, and there is a general air of devotedness about his more deeply religious He has been rather under than over estimated by modern critics. His boldness of conception, freedom of execution and daring inspired to greater attainments his two great pupils. If is Coronation of the Virgin, the pupils His Coronation of the Entrance Triumph of Saint Michael and the Entrance of Jesus into Jerusalem' all contain multitudes of figures, but the tone is gloomy and the coloring decidedly opaque

Nicolás Beceira, who also belongs to the latter half of the 17th century, anticipates the characteristics of the painters of the first half of the 18th century, excellent coloring, boldness of conception and rapidity of execution Another, Diego de Beceira, a Franciscan monk, of the same period, devoted his energies to depicting scenes and events in the history of the order. Many of his pictures were in the convents of the Franciscans in Mexico City and Puebla. Another priest, Nicolás Rodríguez Juárez, shows good coloring, simplicity of style and studied and well-executed drapery, all characteristically foreshadowing the coming school He was the best portrait painter of his day. His 'Santa Gertrudis Offering her Heart to the Crucified Christ' (1690) is in the Mexican National Academy. Other pictures of his are in the Profesa and other churches of the

capital.

Juan Rodríguez Juárez (1675-1728), nephew of José and brother of Nicolás, enjoyed a very high reputation in his day; and he had a strong influence over the younger aitists, who were destined to later establish a new school. He was very prolific and many of his works survive. He painted a series of scenes of the Virgin of Tepozotlán, of which the most realistic and best executed represents the flight into Egypt, 'San Antonio,' 'San Francisco de Querétaro,' 'San Juan de Dios' are in Querétaro; an auto-portrait is in the National Academy. His are the decorative pictures for the altar of Los Reyes in the cathedral. Three paintings in the Profesa suggest Murillo. A colossal San Cristobal and the Vision of Santa Gertrudis' were in San Agustin Church. The Judgment of Saint Lawrence (1702) is a notable picture. In the Carmelite churches are a number of his pictures and four large canvases are in the National Academy. He has a vision of the loveliness of color that re-

minds one of Murillo in no uncertain manner. He preached the doctrine of freedom from restraint and he revolted against the carefullywrought work of the school of the elder Echave. His touch is light, his color bulliant, but his light and shade are weakly defined. He may be said to have been the tather of a school that produced much bulliant work in Mexican

Among the other artists of this period are José Torres, Manuel Orellano, Diego Casanova. Juan de la Plaza (extravarant in coloring and execution) and Manuel Luna (coloring and drawing good). So brilliant is the coloring of the latter's work that much of it has been passed off as that of Murillo and his pictures have been gathered up and shipped to Europe, where they have been sold as works of the great Spanish master

Cristóbal Villalpando painted from about 1683 to 1710 in a very unequal manner, but few if any Mexican artists have had freet and bolder imagination than he or greater power of execution. In his imagination there was much of the poet, but he was affected with the Gongorism of his age and examperation and complexity mark his best work. His coloring is weak and his larger canvases are in poor taste yet some of his decorative work is excellent

"Friat Manuel," a Jesuit puest, has been called the Murillo of Mexico on account of the brilliancy of his coloring, but his drawing is careless. His simplicity boldness and softness of coloring leave no doubt that he had

studied Murillo

Tosé Ibarra (1688? 1756), one of the two best painters of the 18th century, followed Juan Rodriguez Juárez to exaggeration. His figures, perspective and drawing are good and the general tone of his work is pleasing and effective but he shows strongly the mannerisms of his school. He is producid of reds and blues, often in masses, in the style of Murillo. He was a finished artist, a tireless worker and possessed of great natural talent. Many of his pictures exist in Mexico though many have been sold abroad. Nicholás Enriquez, an ardent admirer of Ibarra, was a follower of Rodríguez Juárez.

Miguel Cabrera, the close friend and colleague of Ibarra, has maintained, for considerably over a century, his position in the public estimation as the greatest Mexican artist of He was a most prolific the 18th century. worker. Even to day, after dealers have been collecting his pictures for three quarters of a century and sending them abroad, there are still scores of Cabreras in Mexico. He lived for his art and he painted pictures as Lope de Vega wrote plays, at a hot heat, with no time to pause. In 14 months (1756-57) he painted 32 pictures representing scenes from the life of San Ignacio for the Jesuit convent, and another series of like nature for Santo Domingo. His drawing is freer and better than that of most Mexican painters and he improved much on his inspirer, Rodriguez Juaiez, softening the cruder tones and shunning exaggeration. His grouping natural and excellent, his invention pleas-ing and full of intelligence, his coloring soft yet brilliant cast a certain amount of beauty about all his work. His taste is not so good a- that of Echave the elder, his force less than that of Arteaga and his imagination less hold and free than Villalpando's: yet the general average of his artistic qualities and the tenderness, devotion and mysticism displayed in his characterizations, easily place him in the front row of Mexican artists. His style is easy, light and comparatively free from mannerisms; and his brilliant coloring lacks the solidity of the previous school Like Shakespeare he laid tirbute upon all who preceded him, but upon all he made use of he placed the stamp of his own individuality, in grouping, painting and coloring and idealization. As he was the official painter of the Jesuits, their institutions were filled with his works. So great was his fame in his day that churches, convents, schools, the university and individuals overwhelmed him with orders and forced him to work to the limit of his capacity With tame all kinds of honors came to him both at home and abroad. He was made official painter to the archbishop of Mexico and the archiepiscopal palace possessed many of his works. Rich churches paid him large sums to paint series of pictures for them. The min-ing town of Taxco engaged him to do all the decoration of the new church in that rich district and the church remains untouched to this

day.

The 18th century witnessed the most active period in Mexican art, and more than 200 artists are said to have flourished during the comparatively short space of time. Francisco Antonio Vallejo, Francisco León, Juan Patrico Morlet, José Paez, Nicolás Enríquez and José Alcibar, all followers of Cabrera, reflect the characteristics of his style. Alcibar carried to exaggeration the softness of style of the school. He enjoyed a reputation second only to Cabrera, to whom he was really much inferior in talent, imagination and execution

After Cahiera no passably good artist appeared for almost 50 years, for the enthusiasm that had built up the power of the Church in Spain declined rapidly even before the close of the 18th century; and with this decline, the ejection and adorning of sacred edifices ceased,

and good artists became scarce

The Academy Artists.— For 50 years after the French Revolution the only artists in Mexico were Spanish professors sent over from Spain to the San Carlos Academy of Art and their pupils Aguire, one of these professors, painted the vaulting of the parochial baptistery of the Sagrario; and Rafael Ximeno did extensive decorating. His mural work is good but his oil paintings are poor. The 'Assumption of the Virgin' in the dome of the cathedral is by his hand. It is highly imaginative and full of action and possesses the true aerial quality necessary for ceiling decorations. Juan Saens and José M. Vásques, two of his pupils, helped him constantly in his work. Saens took part in the decoration of the cathedral dome and Vásquez painted the 'Annunciation' and 'Jesus with the Children' in Loreto church, and 'Saint Anthony Sustained by the Angels' in the chapel of the Sagrario. José M. Castio, another pupil, has left some fairly good pictures, one of which is in the National Academy. He exhibits considerable originality in his best work

Francisco Eduardo Tresguerras, a Querétaro artist and architect of note, did considerable interior decoration in which he shows creative power that just falls short of being great

The Puebla School, in the beginning followed Echave the elder, and in general it re-

flects the influences at work in Mexico City. Its artists are inferior to those of the capital García Feirer painted the six large figures that decorate the altar of Los Reyes in the Puebla Cathedral of which he was the architect Diego Beceira executed a series of pictures for San Francisco Church, Puebla, 'Saint Francis in the Desert, 'Saint Francis Accompanied by Angels, and 'Saint Francis in a Chariot of Fire, all of which are strong, realistic and well executed José del Castillo and Miguel de Mendoza, an Indian prince, are two other wellknown Puebla artists Joaquín Magón painted the large mural pictures in the Puebla Cathe-dial sacristy, 'The Last Supper,' 'The Wash-ing of the Feet,' 'The Protection of the Virgin,' and also a series of the 'Passion' in the Carmelite convent and another series on the same subject in the sacristy of Occilán, Tlaxcala His coloring is too vivid and his work has an unfinished appearance Miguel Jerónimo Zendéjas (1724–1816) was exceedingly popular His technique is faulty but his work is pleasing His best picture is 'Christ Praying in the Garden, in the Puebla Sagrario. José Luís Rodríguez Alconedo, an artist of much talent, a sculptor and a botanist, expelled to Spain for revolutionary intrigue in 1808, acquired there great facility in pastel, which he introduced into Mexico. Two of his Virgins are in the Puebla Cathedral and two fine portiaits are in the Puebla Academy, one of himself and the other of a Spanish lady

Later Academy School.—Among the painters of the latter half of the last century whose works are represented in the National Academy are José Ohiegón, whose large painting 'Queen Xochitl,' the discoverer of pulque, the national drink of Mexico, is one of the most popular and best known in Mexico Xochitl is represented as offering her discovery to King Tecpancaltzín, who is enthroned upon his seat of honor in the midst of his royal attendants 'Hagar and Ishmael' is perhaps a better picture, though on account of the subject of which it treats it is not so well or popularly known Rodrigez Gutiérrez' very striking 'Senate of Tlaxcala, represents that body deliberating on the course to be pursued toward the invader The invention and grouping are better Cortés than the coloring Pelegrin Clave's 'Isabel the Catholic Attending her Sick Mother) is one of the best and most attractive pictures of his epoch. The coloring is rich and harmonious, the drawing good and the scene depicted is spirited Juan Cordero has two pictures in the Academy, one representing Columbus and his Little Son at the Gate of Rábida Convent' and the other 'Columbus after the Discovery of America' Juan Ortega's 'Meeting of Cortés and Montezuma' is full of imagination and fine coloring and is indicative of what the author might have continued to do. Salomé Pina enjoyed considerable reputation among his fellowartists. Two of his pictures in the Academy, 'Abraham and Isaac' and 'Saint Charles Borromeo' are spirited in conception and execution Luis Munroy's 'Roman Charity' represents a Roman girl conveying food to her imprisoned father This and the 'Prodigal Son' prisoned father This and the 'Prodigal Son' and the 'Last Moments of Atala' are good pictures Manuel Ocaranza has in the Academy two fairly good pictures in the characteristic style of the middle of last century: 'Love's Wiles' and 'The Faded Flower' Juan Urruchi reverts to the religious school of art of the 18th century in style and subject in 'Let the Little ones come unto Me,' 'Sor Juana Inez de la (ruz' and 'San Sebastian' Gonzalo (arrazco is represented by two pictures, 'Job' and 'San Luís Gonzaga.' The latter scene is during the plague in Rome. Juan Manchola has created two fairly good pictures in 'A Muracle of Saint Peter' and the 'Good Samaritan.'

While the period from 1800 to 1867 generally is unproductive in good paintings, one native painter, José María Estiada, does lend it interest. He has left numerous portraits marked by an ingenuousness, an elegance of line, and a harmony in composition. Nevertheless his people

do not live.

Modern Painters.—The early 20th century Mexican artists followed their own inclinations, which, schooled abroad, gave no note of unity to their work. Preoccupation with technique later gave way to pursuit of native conceptions in subject matter. Not the least influential in this nationalistic movement has been the Mexican Revolution (1910) which brought into focus fundamental social problems. Mural painting has attracted many Mexican artists because if permits free expression of social theories and because it reaches the masses. In theme there is a predisposition toward representation of the lower classes; in technique, an effort to glorify the subject by architectural design and monumental presentation. The feeling of great latent force, of primitive rebellion against tradition, runs through these paintings. Vigor supports one's interest while the mind reads in the painting the whole lustory of a conquered people

José María Velazco, an excellent landscape artist, painted with great care and detail, producing cauvases that won for him renown in Europe. His coloring is delicate and true to nature and his cloud effects are especially happy. Many of his best pictures have found their way to European galleries. France conterred upon him the cross of the Legion of Honor and Austria that of Francis Joseph, and other countries have rendered like tribute to his

genius.

Félix Parra does his work with loving care and in good taste. He shows invention, holdness of imagination and excellent grouping. His coloring, too, is good. Three of his pictures, Las Casas, 'Gahleo' and the 'Massacre of Cholula' have been photographed times without number and copies of them may be found in every curio store in Mexico. They are all striking pictures of sterling worth, in which the drawing is good, the conception vivid and the coloring in good taste. A smaller picture, the 'Flower Market,' is of greater artistic worth, but it is almost unknown, because it has always been in private possession. The comparatively small canvas is crowded with figures, all different and all true to life.

Herman Gedóvius, who received his art education in Germany and who reflects German influence, is probably the best portrait painter Mexico has produced. His early work was labored but his later shows freedom of movement and mastery of color which reminds one of the old Flemish masters. His auto-portrait

in the Academy is excellent.

Leandro Izaguirre, who spent 10 years in study in Europe, is the best known of modern

Mexican portrait painters, but his imagination, execution and coloring are interior to those of Gedóvius. Traguirre once showed signs of possessing daring and inventiveness in his earlier works, especially in his great canvas the Torture of Guauhtemoc,' now in the Academy; but his European residence wearied him of things

Mexican to the loss of native ait

Gerardo Murillo (Dr. Atl) is perhaps the most free of the younger Mexican artists, especially in Mexican landscape effects, which, on account of the high elevation of the valley of Mexico, are very difficult to analyze and depict. Very often his work is more sketchy than solid and he gains his effects in paint through the methods of the sketch artist. Yet he is generally strikingly effective. His constant search for new methods, new colors, makes for intriguing compositions color landscapes. He is the leading landscape artist of the day.

Andrés Rios delights in painting scenes filled with figures. He inclines to historical characters and costume effects of which he has made a deep study. He has imagination, originality and daring in conception, execution and grouping. The Orator of the Day,' which represents parishioners complimenting the voung parish priest on his scrinon, displays Rios' skill in character painting and effective grouping and his love of detail in costumes and salon decorations. The Road to the Poor house' is a powerful picture, well grouped and full of expression in which the same love of carefully executed de-

tails are manifested.

Of those artists who briefly come before the public eye and then recede into obscurity there are many in Mexico. We have only to recall Juan M. Pacheco, Rafael Ponce de León, and Affredo Ramos Martínez, although the last has left distinguished pupils. The "artists of social revolution" as they may be called now hold highest rank in quality painting in Mexico. They have sought the origins of their movement in the revolution and also in the popular engravings and woodcuts of José Guidaline Posada (1851-1913), an immistracted genius who gave Mexico its best folk caricatures, its first studies of social conditions. This influence has not been direct; his work has served to call attention of later painters to a new source of inspiration, the Mexican social scene.

Francisco Goitm (1884), a leading plastic artist, has portrayed eloquently the simple but profound emotions of the people of the soil. Anyone who has studied hi: 'Tata Jesucristo' cannot but be moved by a deep sorrow which conjures up a whole social situation. Noted for his beautiful theatrical decorations seen in the Palacio de Bellas Artes in past seasons, Julio Castellanos (1905) has produced paintings simple and precise in outline, sensitive in emotional tone. Diego Rivera says of María Izquierdo (1906) that "the talent of this painter is well balanced and fiery, but reserved and contained, and develops more at depth than at the surface." Her art, akin to cubism, brings out the characteristics of her subjects which strike her as most revealing.

Roberto Montenegro (1885) is remarkable for his versatility. This painter, engraver, illustrator, artist with oil and water colors alike, has left the lively lines of his mural paintings on many buildings in Mexico. He shows a strong tendency to seek the principles behind his art

Maximo Pacheco (1907) may be taken as the representative Indian artist whose somber colors, design-like figures, show a revolt against European masters. He champions his humble race. Fernando Leal (1900) has decorated several public buildings with murals of scenes from the revolution. He catches the swill of grouped figures. David Aliaro Siqueiros has been more before the public for his leftist political views than his paintings, although the strength of his representations cannot be demed.

More than any other Mexican painter Miguel Covariubias has appealed to the American public for his caricatures and type-studies of people all over the globe. He has published several books of his character studies in the United States.

There is no doubt that the two most distinguished artists in Mexico at the present time are José Clemente Orozco (1883) and Diego Rivera (1886) Orozco, a native of Jalisco, studied architectural drawing in the Mexican Academia de Bellas Artes and, since 1913, has painted murals in Orizaba, Guadalajara (School of Medicine), Mexico (Palacio de Bellas Artes

and Supreme Court building), Pomona College, The New School for Social Research, Dartmouth College, and elsewhere. His grandiose murals are characterized by architectural design, powerful muscular expression, and sobriety of color. Though like Rivera he expresses himself best in passionate illustrations of revolutionary ideology, his conceptions of civil strife are directed to revealing the profound human tragedy it embodies. Rivera, on the other hand, presents a symbolic, panoramic moral conception of Mexican social progress in his murals. His education abroad, his long experience in many media, his great energy, account for the superbly conceived murals which can be found in public buildings on both coasts of the United States and throughout Mexico. Many art critics believe that he is the greatest Mexican painter of all times, and many others hold the same opinion of Orozco.

John Hubert Cornyn,
National University of Mexico.
Revised by Ernest Richard Moore, Oberlin
College.







Courtesy, The American Museum of Natural History

MEXICAN NARRATIVE PAINTING

Upper left: An Aztec ceremony (Codex Borbonicus)

Upper right: The migration of the Nahua tribes (Codex Boturmi)

Lower left The meeting of Cortés and Montezuma (Lienzo de Tlazcala).



Mayan temple at Rio Bee, Quintana Roo.

14. ARCHITECTURE. Pre-Columbian Influence. - Mexico was by far the most important of the Spanish colonies of the mother country, which lavished upon her all the care a mother bestows upon a layoute daughter The fabulous wealth poured into Spain from over seas she dispensed with a liberal hand in beautifying the home domain and in covermg the new land she had discovered with maginfectit edifices which, today, constitute the chief charm of the Spanish American countries. The activity of the arts in Spain was coincident with the direction of that vast treasure that kept constantly filled to overflowing her coffers for almost three centuries. Mexico, more than any of the other American colonies, reflected the activity of the mother country. Especially was this so in architecture and its allied aits, painting, decorating and sculpture. A famous ait critic has justly said that, during the Spanish régime, there were more monu-mental buildings erected in Mexico than in all the rest of America. This was due to several causes. The native civilization had already produced magnificent artisans while Europe was still in the dark ages. The existing runs of the vast, highly ornate edifices erected before Street, fore Spain set foot in America compel the admiration of layman and architect alike. Of the skilled native workmen at the time of the Conquest, thousands had labored under the master builders of Montezuma and of the

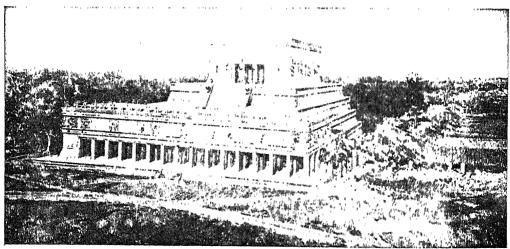


Temple, Nahua atyle, Soutiago Huatusco, Vera Cruz. Atter Dupaix, 1834



Mexican terriative jointing, presenting a seashore in Viicatan (Lemple of the Warriors).

Courtesy, The American Museum of Natural History



The Temple of the Warriors, at Chichen 1tza. Reconstructed by Prof. K. Conant, after Morris, 1931.

sovereigns of Michoacán, of Yucatan of the Zapotecas and the Mixtecas For untold years Mexican artisans had been accustomed to depend very greatly upon themselves in working out their plans and ornamental designs, all of which were controlled by partially conventionalized mythological ideas and Curch polity. The European architects who arrived in Mexico from Spain almost immediately after the Conquest found these native artisans wonderfully skillful and resourceful; and they soon came to realize that the surest way to get the best results was to allow them to work out ideas not from a detailed plan but from rough sketches. The result was that, while Mexico adopted Spanish architecture, it did so with modifications introduced, consciously or unconsciously, by the native workmen who brought to their task traditions that, from time immemorial, had governed then plans and the manner of executing them

Ibero-Indian Transition Period.—The Spanish conquistadores were in spirit much like the Crusaders They tought the races of America in the name of the cross, and they smote the heathen for the greater glory of God They demolished temples; they smashed idols throughout the length and breadth of the land with religious frenzy and they leveled gigantic pyramids that had required centuries for their erection. The priests and monks who followed the soldiers continued the demolition of all evidence of the historic past of the native races But this work of destruction called for a counter work of construction Missionaries spread all over the land; architects were brought from Spain to the larger cities and towns, while native Indian master-builders were employed in the villages and country places under the direction of the Spanish priests who had generally some knowledge of architecture. Soon the passion for building churches, convents, colleges, schools and priestly residences became as great as that for destruction during the first quarter of a century following the Conquest

The architecture of this first colonial period was largely affected by native Indian ideas, as all the workmen were natives. As they did not know Spanish, and their masters and overseers were unacquainted with the native tongue, they were left very much to themselves to work out their own ideas of construction, more or less in conformity with the general plan of the architect or master-builder. In beauty of form and grandeur of conception the buildings of this epoch were very much inferior to the native edifices they replaced. But it was an age of reconstruction in which the builders looked more to utilitarian ends than to beauty. While the great, Moorishlike dome was the dominant feature in Spanish architecture, even at this early date, very few churches with handsome domes or vaulted roofs were built in Mexico or in any of the other American colonies in the first half of the 16th century, for these were architectural features untamiliar to the native artisans. These early Spanish colonial edifices were a curious ad-naxture of Gothic, Renaissance, Moorish and native American styles. In general the plan of the building was Spanish, modified by Moorish. The roof was the flat American structure

in use in Mexico and Yucatan before the Conquest, while the ornamentation was a curious intermingling of Christian and Indian ideography and conventional European and American mythological conceptions Compared with those that followed them, these early Spanish colonial edifices were plain and of unprepossessing appearance But their study is both interesting and instructive, for they point to the buildings that were to come, with their mingling of the best in the art of Old Spain and of New Spain. Spanish domination brought to Mexico a tranquillity and an undisputed authority lasting three centuries, during which the Spanish court directed the energies of the colony and led the way in that great revival of ait such as no other American colony experienced.

Various causes combined to shape the form and character of the public buildings of New Spain. The Aztecs, Mayas and other cultured races, owing to the weakness of their knowledge of scientific construction, had been forced to crect excessively heavy walls to support massive roofs and high ornamental façades, and the huilders brought to their work, during the Spanish régime, an ingrained belief in the necessity fo, and the beauty of sheer massiveness in the construction of walls and façades, a belief which continued throughout the 300 years of Spanish domination Mexico has always been subject to heavy carthquakes, and these have helped to accentuate this belief in the necessity of massiveness in the construction of the main walls of buildings The monumental edifices of the country are often more massive in character than those of Spain The walls of some of the Maya buildings still standing are from 6 to 10 feet thick and these are equalled in massiveness by the walls of the cathedral and other great edifices of the capital.

Building Material.— The more durable building material of Mexico was in no way inferior to that of Spain A score of different kinds of excellent stone, all workable, much of it handsome and some of it, like the native tezontli (lava-rock), of a character to give a distinctive appearance to edifices constructed of it; marble of a dozen different varieties; and onyx as handsome and as varied as any in the world, were all at the command of the Mexican builder There was in Mexico for dwellings, no light, durable earthquake-resisting building material such as existed in the forests of the United States and Canada in the early years of colonization and expansion. Adobe (sun-dried earthen bricks) took the place of lumber in the construction of the houses of the lower and middle classes of the upland plateaux; and it has kept its place to the present in the public favor. Owing to the fragile nature of this material, walls constructed of it are necessarily very thick. In country places even churches are frequently constructed of adobe, which, covered with stucco, presents a very pleasing appearance. There are towns of considerable size in the interior of the table lands where practically all the buildings are constructed of adobe, and the plain mud walls of the Indian pueblos are familiar and picturesque parts of the landscape These are constructed probably as in pre-Columbian days, and villages themselves, with their irregular, lane-like streets, are like their Aztec progenitors

But as adobe is not suitable for the low-lands with their torrential rains, it is replaced there by uncut stone, for the town houses, and in the villages and country by primitive thatched huts with walls of bamboo or other poles, through which the air makes its way at will. Owing to the prevailing mildness of climate all the year and the excessive heat in the hot season, these Indian huts, on the whole, meet the requirements of their occupants, who lead lives very near to nature's heart

The Dome and the Facade.—The architecture of Spain was influenced by the Romans, Goths and Arabs throughout the periods of Romanesque, Gothic and Renaissance supremacy. The Greeks, Phoenicians and Carthaginians, too, have left their impress upon it. It does not, therefore, belong wholly to any one of the recognized styles; but it is, for this reason, none the less interesting. Mexico followed Spanish models more or less closely; but as the Indian mind is prone to floud ornamentation, her architecture departed, in matter of detail, of execution and of adormment, from that of Spain. The Moorish dome, with its striking appearance, its handsome tiles and its frequently elaborate adornment, appealed to the Mexicans. It is, in a sense, related to their elaborately adorned aboriginal façades, towering often from one to two stories above the habitable part of the building. The dome is seen everywhere in Mexico. It peeps out from amid the clumps of trees sheltering the little Indian village; it crowns the summit of a commanding hill; it retreats, almost hidden from sight, to some little valley amid mountain fastnesses Everywhere majestic, it lends a touch of Orientalism to a landscape for which it is eminently fitted

Early Spanish colonial architecture in Mexico was largely influenced by the Gothic and the Moorish; but the buildings erected after the close of the 16th century followed some one of the various phases of the Spanish Renaissance. The Mexican and the Spanish mind alike understood the value of contrast and concentration in decoration. In the Maya buildings the elaborate ornamentation which they lavished upon their monumental edifices was confined, for the most part, to the upper stories, the lower having a plain surface of cut stone or stucco. This disposition threw into relief and thus made more effective the ornate superstructure. The Spaniard confined his ornamentation to parts of the façades, to the doors and windows and the parts of the towers above the level of the roof. This had a splendid cumulative effect, which can be seen in [the illustration] the façades of the Sagrario and the cathedral of Mexico City. This ornate style of decoration was especially fortunate in having for its execution such trained workmen as the Mexican Indians, artisans with ancient traditions to work by, the initiative to give individuality to their work and the skill to put it into execution. Side by side in Mexican architecture, often mingling and blending so as to be indistinguishable the one from the other, are evidences of the many-faced traditions of the native dynastics and the influences of Spain. The free hand of the native work-

man is best seen in the earlier buildings of colonial Spain, for later on he contorms in general to the standards set him by more exacting and better trained architects and master builders But this conformation is only outward. In the spirit of execution the attitude of the Indian mind is still strong. He has taken instructively to the Spanish idea of cumulative effect, which, in another form, was his own, and his inclination in this direction often displays itself in florid ornamentation frequently approaching the uncouth; but it is always effective. In its adherence to Spanish torms, Mexican art is as notorious a disregarder of convention as the Spaniard himself in his adoption of the Renaissance, in building, painting, sculpture and all the arts. It is in this respect that Mexican architecture differs from that of Spain, and it is this very difference that makes it specially interesting, for we see within it the activity of the highly-developed native faces of America, these ancient artist artisans, stone cutters, wood-carvers, metal workers, tile makers and designers of all kinds, essentially thinkers, creators, builders, in love with their work of creation

Styles of Mexican Colonial Architecture.—Of the early colonial edifices of Mexico, more middle age than Renaissance, one of the best examples is the church of San Francisco at Cholula, about which there still clings that mysterious atmosphere that the Indian workman lent to all he touched in the years following the Conquest, while his ancient traditions were still vividly alive.

The Renaissance soon made itself felt in Mexico as it had already done in Spain. The Moorish dome was its inseparable attendant. and New Spain, in a few years, became the centre of streless building activity which was to cease only when the Spaniards withdrew from the country. This movement was at its height when the cathedrals of Mexico and Puebla were begun, in the latter half of the 16th century, when Mexico was under the Baroque influence; and before they were finished the Churrigueresque had supplanted it. The Puebla edifice was built more in accordance with the original Spanish Renaissance ideas of its architect; but the cathedral of Mexico, especially in its interior decorations, was strongly under the influence of these latter two ornate styles, both of which are characterized by the interruption of straight lines, the breaking of entablatures and pediments and an inclination toward unexpected arches and curves. The Baroque retains the original column of the Renaissance, but it takes liberties with it by twisting it out of its primitive shape, running it into panels and stories and decorating it in an imorthodox way.

The Churrigueresque, child of the Baroque, ran to extravagance in its love of the ornate. It made of the column a thing of decoration; it broke it into all kinds of geometrical forms and transformed it into pillars and pillasters, which became part of the mass-decoration. It laid its hand, too, upon the sculpture, making of it an integral part of the decoration scheme from whose involved mass it peeped forth just as did the curved and broken lines of the

Both Baroque and Churrigueresque are char-

acteristic styles of architecture, developments of the Renaissance, influenced by Moorish and other ideas dominant in Spain at the time of its introduction Both are splended in their general effects, in their monumental façades and in their elaborate stone carving which, at a distance, gives to the façades the appearance of one huge piece carved from the living stone en bloc. This is the same impression that the great Maya buildings give. The Baroque in Spain was stamped with a strongly individualistic character, and the Churrigueresque, a very ornate development of it, became in Mexico the most truly expressive medium of the native mind. In the early part of the 18th century Mexico went mad over Churrigueresque, and all the invention, all the grotesqueness, all the leitility of imagination, all the originality of the native mind, were exercised in creating new torms of ornate and intricate adornments for church façades and interiors, which became masses of gold and silver, of richly-adorned columns and pilasters reaching to the lofty ceilings, of elaborate altars, splendid in their intricate carving, their paintings and their dominant tones of the precious metals Intricate scioll work, fruits and shells proclaimed the influence of the native Mexican workman, while strange mythological designs showed that there still reached him echoes of the creed of his ancestors and of his pre-Columbian art. Yet the sense of proportion is ever there, and this strange mingling of various systems of art gives one the impression of a magnificent and unified ensemble. The touch of the artist is ever perceived in the best of these old colonial buildings, for Catholic mysticism, Moorish mysticism and native Indian mysticism seem to feel the bond that binds all mystics together

Influence of Tolsa. — Manuel Tolsa, a noted Spanish artist and architect, who came to Mexico as a teacher in the National Academy of Art in the latter part of the 18th century, had been trained in a school that disliked intensely the Churrigueiesque and he set about reconstructing the interiors of many of the public buildings of the capital, of Puebla and of other cities of Mexico. Under his direction the magnificent Churrigueresque altars and decorations were torn out of the Mexico City cathedral and replaced by very plain Greco-Roman, so that now only mutilated parts of the grand old decorations remain to give an idea of the magnificence of the interior when the most gorgeous of all the Spanish styles of architecture held supreme rule there. Fortunately, however, the north chapel of the building has been left practically untouched; the colossal façade of the Sagrario could not very well have been altered, and its interior has suffered much less than that of the cathe-The example set by Tolsa spread rapidly and it became the fashion to decry this most characteristic of Mexican architecture; and untold harm was done to the unity of the old buildings, very few of which remain intact as their builders left them. The parish church of Taxco, the Sagrario and La Santisima in Mexico City, and San Martín Seminary, Tepozotlán, arc examples of the magnificence of the old Churrigueresque churches in the days of their glory. But even of these only

San Martín and Taxco have escaped the hand of the reformer.

Influence of Puebla. During the Spanish colonial period there were, in New Spain, two centres of art influence, Puebla and the capital. The former was more directly affected by the spirit of Andalusia and the Moors. Cholula, a suburb of the present city, had been a great centre of art and of building activity prior to the Conquest, and its artisans were noted throughout the Aztec empire. So the Andalusians, who settled in the valley of Puebla, found cunning workmen there to help build up the semi-Spanish, semi-Moorish industries they began establishing in the country Excellent beds of clay in the neighborhood helped the work along, and Cholula continued, after the Conquest, the industries the skilled Toltecs the Conducts, the industries the skilled Tolecs had established there before the Normans had thought of invading England. Tile-making, polished marbles and onyx, handsome pottery and clay figures instinct with life and depicting the national customs, became characteristic Puebla products. This industry had a strong influence upon the architecture of the city and the surrounding country Buildings with great Moorish courtyards and exterior and interior decorations in ornate Moresque tile patterns began to make their appearance in Cholula almost immediately after the Conquest and, on the founding of Puebla, the centre of this in-fluence shifted gradually to the new city. Puebla at once began to reflect the thought and manner of life of Seville with which it kept ever in close touch Cholula became a place of Moorish domes elaborately decorated with tiles To-day the little town is exhibited as a curiosity to the tourist as much on account of its all-prevailing church domes as its famous pyramid. Towers, interiors, altars and the hitherto undecorated bulk of great buildings were covered with tiles Private residences and government edifices followed the fashion and Puebla came to reflect more and more the influence of Seville and of Moorish Spain. As Puebla was the one great town on the highroad between the capital and Vera Cruz, it became an important distributing point; and this helped to extend her Moorish influence. Even in the capital this influence is seen in existing buildings and many others of the same style have disappeared The famous Jockey Club of Mexico City, completely covered with bluish tile, reflects strongly this Puebla style. Some of the Churrigueresque churches, whose ornate exteriors are set against a background of Puebla tile, present a gorgeous and fascinating appearance; but in many others the employment of the Mexican Moresque is not so fortunate, for it was not always applied in good taste. Consult Wilcox, M, 'Certain Phases of Spanish Colonial Architecture' (Architectural Record, June 1915).

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15. ETHNOLOGY. Ethnologically Mexico is one of the most interesting of the countries of the Western world. Within her boundaries are represented all the really great cultured races of North America. Her territory forms the bridge of the continents over which surged backward and forward for uncounted.

centuries untold races, many of whom have disappeared forever, leaving behind them buried remains of their arts, their industries, their tribal customs and remnants of their various languages engrafted upon those of the races who succeeded them

The historic races of Mexico belong to a score or more of families, which future intenser study and investigation may or may not show to be related. Many of the languages are divided into sub-families and these into dialects, some of which are quite separate, while others blend into one another so that it is hard to determine where one begins and the other ends. But all are indicative of the presence in Mexico of many races of distinct customs, habits and religious beliefs for a long period of time, and of the changes in the distribution of these people which had already taken place, and which were continuing to take place at the time of the Conquest Mexico, as we see it in the first quarter of the 16th century, presents but one of the many ethnological phases of her kaleidoscopic existence

Origin of Races.—Beside tradition, there is no guide pointing the way to the penetration of the cloud that hangs over the past of these mysterious races, other than such aids as are lent by linguistic studies, comparative ethnological investigations, archaeological remains and such echoes of the past as have come down to us in the complicated mythologies of the various families inhabiting the western hemisphere.

Two great racial traditions in Mexico point to distinctly different origins for the two leading races of the country. Nahua tradition would seem to indicate that they came into Mexico from the north by way of the Pacific coast, while Maya tradition as invariably points to the east and more specifically to the coast of the Gulf of Mexico, as the direction from which they worked southward into their present habitat. And yet, when the great Nahua culture god, Quetzalcoatl, arrived in Mexico, it was by way of the Gulf of Mexico, and when he departed from the scene of his labors, for the unknown land from which he had come, it was by way of Coatzacoalcos (Puerto Mexico) on the Gulf side of the Isthmus of Te-huantepec. This and similar traditions have been used to prove that the Nahua tribes must have come from the east. Much is made of the fact that, while the Nahuas are repre-sented, in their traditions, as coming from the north and west, Quetzalcoatl is as invariably represented as coming from the east, and that, as mythology is always older than tradition, the Nahuas must have come originally from the east and have afterward wandered north and come south again. There is nothing to support this hypothesis. It must be kept in mind that, in these traditions of race migration and in that of the movements of the culture god, there are wrapped up two distinctly different events, which, in all probability, have no relation to one another. Quetzalcoatl's office as messenger of the sun god who sent him on his mission of culture to Mexico necessarily forced him to begin his journey from the direction of the home of the sun which, according to Nahua tradition, was in the east; and the same reason made him sail away again toward the east when his mission on earth had been accomphshed. The creat prophet who came from the sun and the races that arrived from the west and north are, therefore, distinct in origin. The one is the creation of the imagination, the others bid is listen to the echoes of imagination through several centuries of its semi-listonic existence.

The origin of the Mexican people has been traced, by over zealous investigators, to almost every race under the sun Mongolians, Tartars, Japanese, Hindoos, Malays, Hebrews, Carthagunans, Irish, Welsh, Australasians, Es-kimos, Assyrians, Persians, Egyptians and Africans have been successively put forward with elaborate arguments as the original forefathers of the Mexicus people. But it is only within the past half century that serious investigation along scientific lines has been undertaken by properly trained workers. The result of this investigation shows conclusively that, whatever may have been the origin of the races of the American continent, that origm is to be sought for so far back in the past that races, custome, mythologies and tongues have had time to blend and to create a vast number of sub-tongues and dialects with their corresponding tiphal and clan variations. It also shows that Mexico must have been originally populated before the domestication of wild animals, and even before many of the animals of the present day came into use in the Eastern Hemisphere The horse, the cow, the sheep, the goat, the elephant, the camel, that had become an integral part of the civilization of the Old World, were unknown in America prior to the Columbian discovery. In general the animal life of the Western Hemisphere is so different from that of the eastern that a separation of many centuries is necessary to account for this diversity. The difference in the plant life of the Eastern and of the Western Worlds is even more noteworthy.

The uses to which the pyramidal structures were put in Mexico were very different from those to which they were put in Egypt and its neighboring civilized nations. If the buildings of Mexico and Central America have any allmity with those of the Old World it is decidedly not with those of the civilization of the Mediterranean. So, after reviewing the evidence which would derive the original races of Mexico from European or African civilizations, we are forced to come back to the native traditions, which offer us the only glimmer of light in the darkness. As has already been stated, these traditions point to the north as the original home of the Nahua people; and investigators have taken this to mean somewhere in Arizona, New Mexico, Colorado or California. All these conjectures may be partially true, for it is probable the Nahuas were, at various stages of their exodus, in these several places. But it is still more probable that they came from much farther north and that, in their migrations southward, they followed the Pacific coast for a considerable portion of the way. There is a very suggestive similarity between the customs, culture and mythologies of the Nahuas and those of Kwakintl people of British Columbia; and between those of the latter and those of the races of northeastern Asia whom they resemble in appearance. But striking though these similarities are, they go to

show, by their several stages of development, that a very considerable space of time must have elapsed since these widely-separated races

were in contact with one another.

The similarity of the myths and customs of other western and northern tirbes would seem to connect them with the Nahua and with the people of northeastern Asia. As the Nahua and the Maya show affinities in culture, customs and traditions sufficient to suggest that they had a common origin, and as the more recent linguistic and ethnological investigations would seem to confirm this suggestion, the latter probably came from the same original habitat as the Nahua; but in their journey southward, instead of keeping to the coast, they made their inigration eastward across the con-

There are, in Mexico, races much older than the Nahua and the Maya, races that have, undoubtedly, been profoundly influenced by these latter arrivals, but have retained certain characteristics which still proclaim their earlier ori-gin. Of these the Otomi, cojointly with the Chichimeca, are credited, in Nahua mythology, with being the first races created by Camaxth, Tlaxcalteca creator Primitive though these peoples were, it is almost certain, however, that they were not the aboriginal races of Mexico; for in places we meet with strange tongues, curious wrecks upon the strand of time, that seem to have no affinity with those of the races dominant in the days of Moc-

tezuma.

Distribution of Races.-A glance at an ethnological map of Mexico shows that the country is divided into a great number of race areas. One of these, comprising Lower California and a part of Sonoia on the Pacific side, was populated, in Instorical times, by races of a low culture, who had undoubtedly been driven to these confines by the conquering Nahua and other races who swept over the great up-land plateaux. Along the Rio Grande, in parts of Sonora, Chihuahua and Coahuila were nomadic Athapascaus; while east and southeast of these was a still larger area covered by two great, distantly related families, the Packawan and the Tamaulipeco, who occupied a part of Coahuila, all of Nuevo León and most of Tamaulipas. The country included between these areas already mentioned Guanajuato, Michoneán and the Pacific Ocean, was held by the Nahua, a part of whom had migrated southward into Colima, Guerrero, Morelos, Mexico, Puebla, Vera Cruz and parts of the Isthmus of Tehuantepec, of which they held both the north and the south sides. In the heart of their territory, however, were the Tarascaus, who occupied the state of Michoacán, and the Otomi who held Hidalgo, Queré-taro, Guanajuato and parts of San Luis Potosi and Mexico; while on the Gulf coast, stretching north from the city of Vera Cruz to Ta-maulipas, were the Totonaco and the Huasteca, races distantly related to the Maya of Yucatán, Campeche, Tabasco, Chiapas, Guatemala and British Honduras. Across the southern half of the Isthmus of Tehuantepec, stretching like a great blanket into Oaxaca, Vera Cruz, Chiapas and Tabasco, lay the Zoque; and between the latter and the Nahua of Morelos and Guerrero is the home of the great Zapoteca-Mixteca race.

All these separate ethnic divisions show decidedly distinctive racial characteristics. Their languages, industrial arts and mythologies present such variations and dissimilarities as could only come from distinct races or from families separated from one another in the early stages their trıbal lıfe Therefore Mexican ethnology has to deal with these races as such, and also with their relation to one another and the general influence they have had upon one another ethnically; for the mixing and the blending of the races which have successively appeared in Mexico, have been going on for ages, just as they are going on to-day, with added European and other elements

But though the native ethnic elements are gradually losing their distinctiveness, or have already lost it, as in Tamaulipas, San Luís Potosí, Nuevo León, Coahuila and northern Chihuahua, yet there are many states, like Michoacán, Guerrero, Oaxaca, Chiapas and Yucatán, where the native languages are still In these spoken with comparative purity parts of the country racial characteristics

persist.

The Nahua is the most important of all the races of Mexico, on account of the vast extent of territory it covered, stretching as it did from the Rio Grande to Guatemala, the number of distinct dialects and tribes included within its racial boundaries, and the influence of its religious, social and industrial customs, its political policy, its vast trade and commerce and its colonizing propensities. The extent, shape and position of the territory occupied by the Nahua to-day, which is practically the same as at the time of the Conquest, would seem to prove the truth of the tradition that they entered Mexico from the north. They drove, like a gigantic wedge, through the barbarous tribes of the great plateaux lands of northern Mexico, forcing the Seri to the mountainous parts of the state of Sonora on the west and splitting apart the Apache and Toboso and crowding them back to the Rio Grande on the north, and driving the Tamaulipecos and the uncivilized tibes of southern Carbina Management of the contraction of the state of tribes of southern Coahuila, Nuevo León and Tamaulipas also in the direction of the Rio Grande and toward the coast of the Gulf of Mexico Encountering highly civilized peoples in the mountainous and easily-defended states of Guanajuato, Querétaro, Hidalgo and Michoacan, they skirted the latter on the west, making their way through Guerrero, and, pouring over the mountains to the east, overran Morelos, Mexico, Tlaxcala, Puebla, most of Vera Cruz and a part of Tabasco A wing of the migration, coasting further south along the Pacific, left a strong colony on the southern shore of Guatemala, another in the interior and a third in Salvador, while a fourth settled upon islands in Lake Nicaragua and occupied all the land between that body of water and the south-western coast. A fifth crossed the isthmus and took possession of territory on the northwestern shore of Panama, near the Costarican boundary line. The Nahuatl confederacy, headed by the Aztecs, extended its territorial dominion, though not successful in forcing its language on the conquered races or in assimilating them to the customs, the culture, or even to the political system of the Nahua; so that the people over whom it gradually extended its sway remain ethnically distinct to-day. Linguistically the Nahua are divided into a score or more of distinct tribes, all speaking, with variations, the Nahuatl tongne. The Toltees, who had disappeared as a political entity several centuries before the Conquest, were the most noted of the Nahua. They occupied a considerable part of the territory afterward held by the Aztecs at the time of the Conquest. The following tribes are now recognized as belonging to the Nahua race.

The Acaxee, speaking four closely-related dialects, inhabited the mountainous regions of Durango, between the Tepchuanes and the Aztecs. The Aztecs or Mexicans (including Tlaxcalans) were spread over a vast extent of territory from Tabasco, through southern Vera Cruz and across the state of Puebla, Morelos, Mexico and Guerrero, to the Pacific, and thence up along the coast, through Jalisco and Smaloa, past the southern end of the Gulf of California Another group of considerable extent occupies the shores of the Gulf of Tehnantepee The Yaqui, also known as Hiaqui, Cahita, Cinaloa and Smaloa, who were divided into three tribes speaking distinct dialects, Yaqui, Mayo and Tehucco, are closely allied to the Aztecs, with whom they have been classed. At one time they occupied considerably more territory than they do to-day. They extended over the middle and lower Yaqui, the Mayo and the Fuerte districts of Sonora Now, so far as language is concerned at least, they are confined to the Yaqui River district. All the Yaqui tribes were energetic, patriotic and intelligent and they were one of the foremost factors in building up the civilization of Mexico. The Cazcanes occupied the mountainous districts of Jalisco about midway between Guadalajara and Zacatecas. The Conchos, now extinct, but at one time an important tribe, occupied a considerable extent of territory, lying between that of the Tarahumare on the west, the Apache on the east, the Tepe huan on the south and the Rio Grande or the north, their habitat being almost entirely within the boundaries of Chihuahua. The Cora, be longing to the northern of Sonora group of Nahua-speaking tribes, live along the Jesús Mariá River in the state of Jalisco. The Huicholes (Guachichiles, Cuachichiles), accord ing to Orozco y Beira, occupied parts of Cochuila, Nuevo León, San Luís Potosí and Zacatecas. They were between the Laguneros on the north, the Otomi to the southeast and south and the Zapoteca to the west. Catholic missions were early established among them; they were brought under the domination of the Spaniards and their language finally disappeared as a tribal institution. In the heart of the Yaqui country were the Nio, who lived south of the Fuerte River. The Niquiran, one of the Nahua cottlement, further country were the results for the resul settlements furthest south, form a small community occupying the land between Lake Nicaragua and the Pacific Ocean and also the neighboring islands in the lake. About the headwaters of the Hermosillo and Yaqui rivers, between the Seii on the west, the Apache on the northeast, the Pima on the northwest and south, was the important Opata tribe, which consisted of two sub-tribes speaking distinct dialects, Eudeve (Heve, Dohema) and Joval (Ova). The most northern Nahua family, the Pima, was divided into the following scattered groups: Pima Alta (Upper Pima), situated

principally in the United States, but occupying a small part of northern Sonora; Puna Baja (Lower Pima), who lived around the middle part of the Yaqin River, between the Tarahu-mare to the east, the Yaqin to the south, the Sen to the west and the Opata to the north; Potlapigua, near Babispe, northwest of the Opata country, Pima de Bamoa (Sinaloa), in and around Bamoa, on the lower Smaloa River, south of the Mayo; Tepehuan Punas, a small group in the western part of the Tepchuán country. In southwestern Salvador are three settlements of Nahua known as Pipil and closely related to the Aztecs, while the Sugua (Segua, Xicagua, Shelaba, Chicagua, Chichagua), a small Aztec colony on the northwestern side of Panama, marks the southermost limit of the Nahua extension. South of the Apache, east of the Concho and north of the Tepchrian, lived the Tarahumare, an extensive division of the Nahua tamily, covering parts of the states of Sonora, Chihuahna and Dinango. They spoke a number of distinct dialects and their territory was divided into Tarahumare Alta and Tarahumare Baja Tarahumare proper was spoken in the upper country while the tongue of the lower land was known as Chimpa. The Tepecano, closely related to the Tepehuán, occupy the territory between that of the Cazean and the Guachichil in modern Tepie. The Tepchuán live principally in the state of Durango, south of the Tarahumare, where they are coulined, for the most part, to the mountainous regions for a distance of about 250 miles

The Olive (Olivean), a race of lightercolored people than the tribes surrounding them, occupy territory southeast of the Pisone and Janambre, in the state of Tamaulipas Tradition says they came from Florida, which may mean only the Gulf coast. They were superior in culture to their neighbors, but nevertheless their language has become extinct.

The Pakawan or Coalimitero is the name given to a number of cognate tribes of southern Texas and northern Mexico. They covered considerable territory east of that occupied by the Toboso. This included, in Mexico, the eastern side of Coalimia, most of Nuevo León and the northern part of Tamauhpas. As these tribes were inclined to be normadic and were but partially civilized, they rapidly lost their language after their conquest by the Spaniards

guage after their conquest by the Spaniards, Otomi (Hia hiu). The word Otomi is used in two senses. It signifies the race of people speaking the Otomi language, and it was extended to include, in a general way, those races which from time to time formed loose alliances with the Otomi for war or defense. have been confounded with the so called Chichimeca, and some authorities claim that they form one of the ethnic divisions of the latter very indefinite tribal designation. The Otomi, who had distinct customs and a complicated mythology, but were less civilized than the Nahua, occupied a large, somewhat irregular, yet compact portion of central Mexico, where many of their descendants may be found to-day still speaking their ancient tongue. Their territory extended over part of San Luis Potosi, all of Querétaro and most of Guanajuato, reaching into the state of Mexico, a short distance south of Mexico City, and from there westward to Michoacán. On the east were the Huasteca, on

the southeast the Taiascans and along the northwest the Nahua They were divided into four tribes. Otoni proper, Pirinda, Pame (northwest of the Otoni) and the Mazahua (cast of the Taiascan, in the southwestern part of the state of Mexico). In the time of the later Aztec empire the Mazahua occupied the province of Mazahuacán situated in the western mountains of the valley of Mexico. They were subject to Tacuba. The Pirinda territory was principally in the valley of Toluca, and some descendants still live in villages in the land of the Mexicans, others in Taiascan territory. The Otomi were a numerous, industrious and fairly intelligent race.

Under the heading of "Rio Grande tribes," Offozoo y Berra groups a number of native communities occupying territory in the state of Tamaulipas at or near the mouth of the Rio Grande River, but he furnishes no further data respecting them with which to classify them, but as the Indians of this district no longer retain their tribal organizations, and as their languages have also disappeared, little is known

of their pre Columbian culture

The Sett, who occupied a considerable extent of territory on the mainland opposite the peninsula of Lower California, where their language is still spoken to some extent, are classed among the less civilized of the Mexican races. Their territory stretches inland into the mountain region for 150 nules or more from the coast, and includes the island of Tiburón

(shark) in the gulf

Under the head of Tamaulipeco, Orozco y Berra, who has paid more attention than any other investigator to the races of Tamaulipas, where the native languages have all practically disappeared, gives the following tribes Tamaulipeco proper, Canaynes, Quinicuanes, Borrados, Tedexenos, Pasitas, Tagualilos, Carbayes, Mariguanes, Panguayes, Anacana, Cadma, Guixolotes, Pintos, Comecrudos, Malnichenos, Ancasignais and Arctines

The Tarasco (Michoacano), occupying approximately the state of Michoacán, speaking a distinct language and having customs, myths and traditions different from those of the other races of Mexico, form one of the important racial divisions of the republic. They are a highly cultured people and, in the time of the Aztec empire, they maintained a separate, inde-

pendent government.

From the city of Vera Cruz northward to the Huasteca and inland to Tlaxcala, he the Totonaca, almost completely surrounded by the Nahua. They were a cultured race at the time of the Conquest, and it was among them that the conqueror, Cortés, established the first Spanish government and colony on the mainland of the American continent.

Two cognate tribes, the Waicuri and the Pericu, occupy the southern end of the Isthmus of Lower California Their languages, which are still spoken, are very badly corrupted

The Yuma family is represented in Mexico by the Cocopa (Cucapa) and the Cochimi, who occupied all but the southern one-fourth of Lower California The native tongue is already badly corrupted and is last disappearing.

The Zoque, stretching over four and one-half degrees of longitude, across the Isthmus of Tehuantepec, from east to west, and occupying parts of the states of Oaxaca, Chiapas and

Tabasco, are surrounded by Zapoteca, Chinanteca, Maya and other races The Zoque family is divided into four branches, Mixe to the north and west of the main territory, Zoque proper, to the south and east, Tapachula, in the southeastern corner of the state of Chiapas, on the Guatemala boundary line, and the Popoloco in the state of Puebla

The great Athapascan family is represented in Mexico by the Toboso and the Apache The area and location of land occupied by these two nomad, warlike tribes changed from time to time, but, roughly speaking, the Apache occupied an irregular territory, stretching southward from the Rio Grande and the American boundary line for a distance of five degrees of latitude, from about 105° westward, covering parts of Chihuahua and Sonora But they often raided over the northern part of the latter state far into the interior. The Toboso also occupied territory stretching from the Rio Grande southward, but their general habitat reached eastward from the western boundary line of Coahuila, within which state they lived in normal times. They often joined hands with the Apache in raids on the more civilized parts of the surrounding country; and they frequently gave the United States and the Mexican governments considerable trouble. Sometimes the depredators took refuge on the American side after a raid on Mexican citizens and vice-versa when they had raided American territory

In and around the town of Chinantla, south of Vera Cruz, occupying territory about 100 miles in extent, are the Chinanteco, who are probably a survival of one of the ancient races who populated the country before the arrival of the Nahua The Huave (Huabi, Guavi, Juave, Wabi), another primitive race, occupy the marshes around the great lagoon which forms the northern inlet of the Gulf of Tehuantepec. Tradition says they once possessed all the isthmus country and that they came from the south The Janambre, a third primitive tribe of a very warlike disposition, who occupied the rugged southwest of Tamaulipas, from a short distance north of Victoria to the southern boundary of the state, about 100 miles, gave the Spaniards much trouble before they were finally conquered toward the close of the 18th

century.

To the south and east of the southern Nahua and stretching from Guerrero to the Isthmus of Tehuantepec was the home of the great Mixteca-Zapoteca family, which in culture, intelligence, enterprise and achievement was ligence, enterprise and achievement was scarcely inferior to the Nahua and the Maya, between whom they seem to have been the medium of communication and of the distribu-tion of the arts and sciences They possessed a culture which, while it resembled that of the Maya and Nahua, was nevertheless distinct The Mixteca whose territory extended into parts of Puebla, Guerrero and a considerable portion of Oaxaca, were surrounded on the north and west by the Nahua, while the Zapot-eca were their neighbors on the east They had an outlet on the Pacific Ocean to the southwest, which they may have possessed for a long time, since it is the boast of one of their oldest legends, that their great culture hero, Yucano, defied the Sun, engaged him in combat and drove him into the ocean. The Mixteca language is still spoken over most of the Mixteca country The traditions of the Mixteen make them an alien race fighting desperately for years for their existence, in the mountains, a part of which they were forced to abandon The rugged nature of the country in which they lived created, in time, numerous dialects of the Mixteea To the east and partly to the south of the Mixteca country lay that of the Zapoteca, stretching for a considerable distance along the Pacific Coast and occupying the southern side of the Isthmus of Tehuantepec, reading north and west of the city of Oaxaca and including the famous valley of Oaxaca, in the moun tamous districts of which the native tongue is still spoken with comparative purity. The pottery and the metal work of the Mixteea and the Zapoteca were sought by the Mexican metchants, who distributed them over a wide area

of country. The Maya family, the most highly civilized of all the native races of America, is divided into two great groups, the Maya and the Kiche, to which may be added the Huasteca. The Maya proper, within whose territory were contained most of the semi historical cities of the more advanced culture of Mexico, were spread over all the pennsula of Yucatan, eastern Tabasco, British Honduras and the island of Carmen. They were divided into Lacandón, Mopán and Itzae or Petén, three tribes speak ing slightly different dialects. The Lacandon still inhabit a region near the headwaters of the Usumacinta River, in eastern Chiapas and northern Guatemala. They were once a very extensive and important people, but their an cient greatness has disappeared. They still speak their native tongue. The territory of the Itzae occupied a part of northern Guatemala and eastern Yucatán stretching westward probably to Campada. probably to Campeche and southward to Chia The Mopán occupied an undefined term Das tory partially in southern British Honduras, Guatemala and Chiapas To the south of them were the Chol, also a Maya tribe, to the west the Lacandon and to the east and north the Itzac

The Huasteca, a tribe situated far from the parent stock, and extending from Tampico southward and westward is wedged in between the Otomí on the west, the Nahua, Totoma and Tamaulipas tribes on the north. It was once a powerful nation and the people of to-day still bear all the racial characteristics of the Mayas.

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16. LITERATURE Among the many cultural achievements of the native inhabitants of New Spain was a thriving literature. Chronicles of the wandering, of the tribes had long been kept on folding books made of magney paper. Native scribes recorded their thoughts by means of ideograms. Thousands of these books or codices were burned by Spanish zealots who believed them to be obstacles to the salvation, through Christianity, of the pagan peoples. A few codices have been preserved and it is from them that much of our knowledge of early Indian cultures derives. In addition there existed a large body of legends and poems which specially instructed orators passed on from generation to generation by word of mouth. This literature would have disappeared with the conquest of the natives had not the Spaniards supplied, in the phonetic alphabet, a means for its preservation. The well-trained and highly intelligent native writers were persuaded by early missionaries to compile by means of the new phonetic symbols their chronicles, oral tra-ditions, and religious rites. This they did by phonetically transcribing in Nahuatl, Quiché, and other Indian languages, much of their "floating literature.» Spanish cleries, conversely, learned native languages and translated these native annals, often quite strictly. The so called Codice Ramírez, properly a translation of ancient Mexican history into Spanish by Father Juan de Tovar (?), is a good example of this process. These post Conquest chronicles make up, in part, for the loss of the pre Conquest codices. Nevertheless our records are but a small part of an extensive literature flourishing in the first half of the 16th century. We owe much to such missionaries as Diego Durán, a native of Texcoco, the seat of the Aztec Empire; Bernadino Sahagun, who first came to America in 1529; Diego Reynoso (?), who wrote down in Quiché the famous Mayan traditions known as the Popol-Vuh'; and other historians contemporary to the Conquest. The bulk of native poetry known today derives from one invaluable manuscript collection, the 'Cantares Mexicanos,' which luckily survived the ravages of time and indifference finally to be printed and translated into Spanish, German (in part), and English at the turn of

the 20th century. These poems deal mainly with the derives worshipped by the Indians. Contemporary historians tell us that singers were schooled in the temples to sing the praise of Huitzdopochitl, Tlaloc, and other gods. We also know that the Indian monarchs listened eagerly to "songs about their greatness and their victories and conquests and noble lineage and their awesome wealth» (Durán) But if verse served the purpose of gods and the pride of kings it also exalted the passions of commoner folk. Durán complains that «songs of love and flattery» affected the proper comportment of natives whom he proposed to convert. These poems, remarkable for their involved metaphors not always decipherable today, were recited or sung with a musical accompaniment, which imparted to them a thythm now lost. Rime was not used. The principal poet among the Aztecs was the great Netzalinalcóyotl (c. 1440), king of Texcoco Living in the Golden Age of Mexican culture, he used his talents and wisdom to better the lives of his people. But he was also a philosopher and poet, for he sang the warning that "all is like the bouquets of flowers which pass from hand to hand, which finally fade and flee this present life »

Cortés in one of his Cartas makes known the existence of native drama by describing an openan stage set up in a market place. From other writers it is evident that the indigenous theater had developed out of pantomimic dances executed before the altars of the gods. Although no authentic native dramatic compositions have come down to us, contemporary missionaries describe them as highly symbolic in meaning and not devoid of slapstick comedy.

The evangelization of the conquered peoples

of Mexico came as the prime task of the Spanish friars and priests in the 16th century. Largely as a consequence was the press founded (1539?) and the Royal University opened (1553) Priests became learned linguists who wrote and pubnecame learned iniguists who wrote and published, from 1539 on, grammars, catechisms, and tracts in Náhuatl, Otomí, Tarasco, Maya, and other languages. Among the most notable of these writers were Pedro de Gante, who published the first 'Doctima' (1547) in Náhuatl, and Along de Malier cardio of or graduat and Alonso de Molina, author of an excellent dictionary and grammar (1571) of the same

langunge.

Other linguists left as monuments to their industry valuable histories of New Spain's ancient civilizations. Bernardino de Sahagún, a Franciscan friar, wrote and tewrote in Spanish and in Nahuatl a superb Historia general de las cosas de Nueva-España' (first published 1829-30); another of the Franciscan Order, Toribio de Benavente, who took the native word for «poor» as his own name, «Motolinia,» wrote a history of ancient Mexico (published 1858); a Dominican friar, Diego Durán, left an interesting and detailed study called Historia de las Indias de Nueva España, which did not reach the press until 1867. No less important as an the press until 1807. No less important as an account of the conversion of pagan New Spain is Fray Jerónimo de Mendieta's 'Historia eclesiastica indiana' (published 1870). Mention hardly needs to be made here to that classic of Mexican histories, the 'History of the Conquest of New Spain' (1632), which Bernal Díaz del Castillo 1861 in amounts are of the Cortés campaigns lest in remembrance of the Cortés campaigns Numerous other histories seen and described by José Mariano Beristáin a century ago in his

'Biblioteca Hispano Americana Setentrional' (1816-21) have since disappeared More fortunate were José de Acosta and Fernando de Alva Ixtlilxochitl, whose histories have been preserved

The post-Conquest drama in Mexico did not develop out of indigenous beginnings; it was brought in from Spain as a device for edifying the newly converted peoples. The development of religious drama in Europe was recapitulated step by step in Mexico, with, as was natural, an accelerated pace. Miracles, the passion, and the lives of saints formed their substance. They were presented inside and outside the churches, in Spanish and in native languages 'Judgment Day, the first play mentioned in contemporary writings, was presented in Santiago Tlatifulco in 1533. It must have been popular, for many other plays followed it. In 1539, to celebrate the signing of a peace treaty by Charles V and Francis I, the first secular production, 'The Conquest of Rhodes, was staged The Jesuits soon after their arrival in 1572 established the custom of giving school plays Of these only one, the five-act Triunfo de los santos (1579) remains extant Aided by cash and prize awards, certain authors made yearly contributions to the religious and secular stage. Most of these never went into print, Before 1600 two theaters or Casas de comedias were in use. Space permits Casas de comedias were in use. Space permits the mention of only two Mexican dramatists: Juan Pedro Ramírez (b 1545) and Fernán González de Eslava The former, the first native-horn American dramatist, wrote the symbolic drama 'El pastor Pedro y la Iglesia Mexicana' to honor Pedro Moya de Contreras upon his investiture as Archbishop of Mexico (1574). The plays of Eslava, 16 coloquios and one outrem's, appeared in a posthumous collection. entremés, appeared in a posthumous collection, 'Coloquios espirituales y sacramentales' (1610), though they had been written and enacted during the last third of the previous century. This is the only considerable collection of the century. In judging these plays it has to be kept in mind that they served not art but their audience. Viewed in this way they stand as signposts and monuments to the cultural aspirations of colonial Mexico

That linguistics and history did not attract all writers is proved by the fame Fray Alonso de Veracruz earned with his studious philosophical treatises No less remarkable are the works on medicine by Dr. Francisco Bravo ('Opera medicinalia,' 1570), Alonso López de Hinojosos and Agustín Farfán; the 'Diálogos militares' (1583) by Dr Diego García de Palacio; and the first American collection of laws, the 'Cedulario de Puga' (1563)

lario de Puga' (1563). In days when men fought to bring European dominance to America and American wealth to Europe, poets with little stake in either enterprise could not flourish. Yet a few versifiers on public occasions raised their voices and found audience. Not until 1585 did a real opportunity—the sessions of the Third Mexican Concilium present itself. Then, according to Bernardo de Balbuena, by exception a real poet, 300 «poets» put in an ephemeral appearance. Fernán González de Eslava, commenting on their number said bluntly: «hay más poetas que estiércol» Omitting mention of famous Spanish poets who came to visit New Spain we shall refer only to three native writers of verse. The first poet born in Mexico and perhaps in America was Francisco de Terrazas (b before 1519), whose extant poems, recently edited, seem to belie Cervantes' praise of him in the 'Galatea' «Honest mediocrity» states the famous Mexican critic, Joaquín García leazbalecta Saavedia Guzmán wrote a long epic poem about Cortés, 'El peregrino indiano' (Madrid, 1599), which is more important as a chronicle than as a work of art and imagination. Some critics consider Bernardo de Balbuena (c. 1562-1627) the foun-der of Mexican and American poetry. His 'Grandeza Mexicana' (1001), «a sort of poetical topography," eulogizes in rich, if pompous, verse this country in which he lived many years Mexico proudly ranks him among its greatest poets.

Francisco Salazar Ceivantes, a keen observer and intelligent teacher, wrote the only «light» literature published before 1000 in New Spain His 'Diálogos' (1554) describe in excellent Latin social and intellectual life. They were intended as additions to the dialogues of Lins Vives with which they were used as class texts at the university. They not only are pleasant to read but also form an invaluable document of society at

that time.

Seventeenth Century - Marked by lively polemics between episcopal authorities and religious communities (e.g. Juan de Palafox y Mendoza, Bishop of Puebla versus the Company of Jesus) and circumscribed by religious conven-tions, literature nevertheless set the pace for cultural advancement Regional historians (Antomo Tello), chronclers of religious orders (Grijalva), and writers of pious traditions (Florencia) flourish. The most fecund theme by far for pious writers has been the miraculous appearance of the dark-skinned Virgin of Guadalupe before Juan Diego, a humble Indian, for the purpose of founding a temple in her honor. Her mage was left imprinted upon his carrying net so that the bishop would believe in the apparition too. Apparitionists and their opponents have kept the Mexican press busy through the centuries, from the time of Valeriano (loth century) to that of Pather Cuevas, marshaling facts and opinions in support of their opposed beliefs. Ignacio M. Altamirano left in his Paisajes y leyendas) (1884) an interesting study of this tradition. Mariano Cuevas recently issued a scholarly memorial volume of guadalupana

The production of grammars, dictionaries, and treatises continued during this century. These were written in or about the native languages Latin, on the other hand, remained the chief language of serious and occasional literature alike. Numerous Latin inscriptions, epigrams, distichs, and long poems adorned the preliminaries of learned books or filled memorial volumes when famous personages came to the new-or left for the future-world. Spanish verse also increased in quantity. In a literary contest sponsored by the university and dedicated to the Immaculate Conception of Virgin Mary, over 300 compositions were submitted. Compiled by Carlos de Sigüenza y Góngora these poems, in the 'Triumpho Parthénico' (1682), represented the triumph of a Spanish literary mode, Gongorism, over real poetic creation Siguenza, the most learned man of the century in Mexico, though opposed to this attempt to pour Spanish back into Latin syntactical moulds, nevertheless was himself influenced by it. But only in his poetry. His 14 published and 30-odd manuscript

writings were noteworthy contributions to letters ('Infortunios de Alonso Rauniez,' 1690), joun-nalism ('Mercurio volante,' 1693), history ('Parayso occidental,' 1683), and especially to science (4 ibra astronomica y filosóphica, 1690). Most of his manuscripts, including valuable histories, have been lost. A similar fate has met the philosophical treatises propounded but never published by a dozen other authors

In the collections of poems described above, both religious and secular verse appeared. Religions topics gave greater freedom of expression to poets in those days than did the eulogies written for the king or for friends. Few read these poems nowadays Even the very popular Canción a la vista de un desengaño which once brought great tame to its author, Matias Bocanegra, who sought to glorify religious life, Bocanegia, who sought to glorify religious life, now is forgotten. The "salaried poets of the Mexican Cabildo, Arias Villalobos, faired no better. One poet slines alone in the obscurity of this century. Sor Juana Inés de la Cruz (1651-95). Possessed of a faire talent and a burning mysticism, this great writer broke for a time at least the bonds of her age and sang of sacred and mundane love as no one ever had before in the New World Her poems, such is their power and universal appeal, still stir the modern heart. A splendid drama, 'Los empeños de una casa,' is among her achievements. Though appreciated by men like Siguenza y Góngora, she was counselled by cleries of meaner spirits to abandon learning and the arts for soli-tinde and silence. Their officiousness lost much for the nation.

Another of the greatest of Mexican writers also belongs to this century. Juan Ruiz de Alarcón (c. 1580 1639) though born in Mexico wrote for the Spanish stage. Both countries claim him now although neither rewarded him during his lifetime for his dramatic creations. These, in perfection of style and technique and m excellence of character portrayal, surpassed the plays written by Lope de Vega and other great Golden Age Spanish dramatists. It does not matter that Alarcon's plays developed outside the Mexican literary situation. His plays are Mexican for the reason perhaps there are others that works of art belong to the people

who can understand and appreciate them. Eighteenth Century. The talse literary notions of 17th century explainsm continued to restrain fine poetic expression during the following century. The same schooling of the Jesuits in the classics and the response to French influences, in Spain and New Spain, later in the century started a classical reaction against euphuism which put new life into Mexican letters. José Manuel Sartorio (1746-1829) and José Manuel de Navarrete (1708-1809) are foremost among the poets. The former's verse now seems prosaic; the latter still enjoys a reputation for graceful odes and sonnets. Only recently was it learned that in his many delicate songs about Clorila he had other than an imaginary lady in mind

Literary contests continued to excite, on propititious occasions, native writers to win the poet's laurels. 'Obras de eloquencia y poesía' (1791), produced upon the ascension of Charles IV, seems hardly more than testimony of loyalty on the part of colonial intellectuals. No succee passion or deep felt emotion transforms these

verses into living art.

The laurels really go to three Jesuits who honored the country which expelled their order (1767) with their Latin works in the best humanist tradition. Diego José Abad published a poem, 'Musa americana,' on the attributes of God, in Cesena in 1769, Rafael Landívar, cone of the latin treatment of modern Latinuty belonger. of the best poets of modern Latmity," belongs to Mexican literature because of his Rusticatio mexicana' (Bologna, 1782) in which he described the beauty of Mexican countryside and customs; Francisco Javier Alegie (1729-88) lest in addition to several original and translated epics a history of the Jesuits in Mexico. Also a Jesuit, Francisco Javier Clavijero published abroad a comprehensive history of Mexico, Storia antica del Messico (1780-81), and a useful reference work for American historians, his 'Storia della California' (Venice, 1789). The histories written by Mariano Veytia and Andrés Cavo during the same period appeared in print in the next century. The first attempt in the Americas to compile a bio-bibliography of native writers was the work of Juan José de Eguiara y Eguren. His Bibliotheca mexicana' (1755), incomplete and difficult to use, is still a useful source book. In its day it won tame for the author and esteem abroad for Mexican writers

Two theaters existed in Mexico, and at least three theatrical companies brought the famous Spanish plays of the Golden Age to Mexican audiences Mexican dramatists failed to contime the remarkable dramatic genre created

by Sor Juan and Alarcón.
This century in Mexican literary annals cannot boast of many achievements. Mexico did, however, keep ahead of other Latin American nations. Particularly important is the appearance m Mexico City of the Gaceta de México in 1722, the first American periodical. Its editor, Juan Ignacio Castorena y Ursúa. A few years later Francisco Saliagún y Arévalo established a homonymous successor to the short lived Gaceta. The scientist José Ignacio Bartolache issued his Mercurio volante later in the century (1772-73). Then José Antonio de Alzate y Ramírez (1799), a sincere lover of learning and one of Mexico's greatest scientists, published a series of periodicals between the years 1767 and 1794 which raised journalism to a very high plane From a literary point of view his most valuable journal was the Gaceta de literatura which appeared intermittently from 1788 to 1794. It contained for the most part profound treatises on botany, astronomy, and mathematics; its poems and articles of literary criticism are interesting for the light they throw on the decline of belles lettres. Alzate sternly criticized the writings of Joseph Rafael Larrañaga, a minor poet, and Joaquín Bolaños, an early novelist.

Nineteenth and Twentieth Centuries .-Two facts greatly influenced the course of Mexican letters in the opening decades of the 19th century: the increasing freedom of expression which finally became an open revolt against the controlled press; and the concomitant increase of literary media. Until independence was fully achieved in 1823 pamphlets, broadsides, and periodicals served as weapons to combat Spanish dominance in the colony. What was Spanish dominance in the colony. written was intended for the time and for a purpose; now it appeals only to the historian. In the period of national reorganization which followed independence a consciously national litera-

ture came into being.

Among the last of the colonial poets, writing in competition with the dozens of versifiers whose poems were published in the Diario de Mérico (1805-17) and the Gazeta de México (1784-1810), was one real poet, Manuel Navarrete, mentioned above. His sad songs were an elegy on the disappearing colonial Mexico. His contemporaries, for example, Anastasio de Ochoa, Agustin Pomposo Fernández de San Salvador, and José Agustín de Castro, wrote little of lasting value The generation of poets who followed them—Francisco Severo Maldonado, José María Cos, Andrés Quintana Roo, José Joaquín Fernández de Lizardi, all Mexican patriots who fought in the War of Independence -sang with more fervor though not with more artistic results The romantics, Fernando Calderón (1809–15) and Ignacio Rodríguez Galván (1816-42), added to the nationalistic note a lyrical strain Passionate love and tragic sentimentality inspired their songs. Both were playwrights popular on the Mexican stage Later in the century Manuel Flores (1840-85) and Manuel Acuña (1849–73) added to romanticism deep sincerity and profound emotion, respectively. Side by side with romanticists there wrote a group of eminent classicists. José Joaquín Pesado (1801-60), Manuel Carpio (1791-1860), and Alejandro Arango y Escandón (1821-83), all inspired principally by religious themes. This group also had its dramatist of stature in Manuel Eduardo de Gorostiza (1789-1851) His plays, published abroad, gained him considerable fame în Spain Guillermo Prieto (1818-97), a fecund poet of the people, and Ignacio Ramirez (1818-79), a free-thinker classical in style and clarity of thought, went their individual ways and yet exerted more influence upon later writers than most of their contemporaries.

Manuel Orozco y Berra (1818-81), Lucas Alamán (1792-1853), Carlos María Bustamante (1774-1848), and before them Fray Servando Teresa de Mier (1765-1827), José María Lusa (1780-1827), José María Lusa (1780-1827) Mora (1794-1850), and Lorenzo de Zavala (1788-1836), made distinguished contributions to 19th century history Bustamante, though not scientific in his methods, rescued several ancient histories from oblivion by publishing them at his own expense Orozco y Berra has come to be regarded as the leading historian of the century.

After the pathetic Maximilian had been dethroned by Juárez and his republican army, Mexico enjoyed a rebirth of national energies. Literature was signally benefited Curiously enough a pure Indian writer, Ignacio M. Altamirano (1834-93), led the renascent movement. When Mexican intellectuals returned from the fields of battle he led them upon another front, founded literary magazines (El Renacimiento, 1869), literary circles (Veladas literarias, 1868), societies (Mexican Academy, 1875), and established a genuinely nationalistic program for Mexican men of letters (Revistas Interarias, 1868). The greatest advances were made in the novel, studied later in this article. The romantic and the classical schools continued to find supporters. Acuña and Flores best represent the former; Ignacio Montes de Obregón (1840–1921), Joaquín Arcadio Pagaza (1839–1918), and Manuel José Othón (1854–1906), the latter A new movement, coming originally from France, gained ground in Mexico and produced some of Mexico's best poets. Stemming from the Parnassians, Manuel

Gutiériez Nájera (1859-95), initiated modernism in Mexico. His delightfully graceful poems (and short stories) appeared mainly in the Revista Azul (1894-90), which became the celebrated organ of the new poets. The Receita Moderna (1898-1911) and Amado Nervo (1870-1919) are intimately linked together in the further development of modernism toward a new vivacity, freedom, and simplicity of expression. Other outstanding poets in this group Salvador Díaz Mirón (1853-1918), Luis G Urbina (1868-1934), José Juan Tablada, and, most famous of living Mexican poets, Enrique González Martínez (1871).

On the Mexican stage many Spanish and French plays (translated) were given during the 19th century. Native writers of the second half of the century did not succeed in mastering the gente. The dramas written by José Rosas Moteno, Alfredo Chavero, and José Peón y Contreras (1843-1907) are now all but forgotten. Only José Joaquín Gamboa (1878-1931) of later writers has a just claim

to original and forceful dramatic composition.

A word at least is due Luis González Obregón and, especially, Joaquín García Icazbalceta (1825-91), whose deep love for, and learning in, Mexican history and literature created at home and abroad a new respect for Mexican letters. One of the major accomplishments of Mexican scholarship, as well as one of the finest examples of typography, is the latter's Bibliografía mexicana del siglo XVP (1886).

In the 20th century Mexican writers are distinguishing themselves in many fields. Among the critics Alfonso Reyes holds first place, after him, Ermilo Abreu Gómez, Julio Jiménez Rueda, Francisco Monterde. Experimentation has been carried on in poetry by Ramón López Velaide (1888-1921), Xavier Villauriutia (1903), and others. Juan B Iguiniz and Mariano Cuevas have investigated Mexican Instory. José Vasconcelos, Eduardo Ramos, and Antonio Caso stand out as philosophers in a field which is growing rapidly.

The influx of Spanish refugee writers into Mexico since the Spanish Civil War has had a salutary effect upon native writers. Many new literary publications of high ment have been founded. And a new impetus is being felt in philosophy, philology, literary criticism, and the

novel

The Mexican Novel.—The pre-eminence of this genre in modern Mexican literature calls for a separate treatment here. A careful scrutiny of early Mexican prose reveals eight forerunners of the novel, which, it is generally agreed, began in 1816 with 'El Periquillo Samiento.' Four of these, never published, have disappeared, leaving colonial literature the worse therefor. The first novel written and published in New Spain was, beyond all doubt, Francisco Bramon's 'Los sirgueros de la Virgen' (1620), a religious pastoral novel. It enjoys the distinction of being the first novel written in the Americas by a native-born writer. Carlos de Sigirenza y Góngora novelized the travels of a Spanish trader in his 'Alonso Ramírez' (1090) in order to please Viceroy Galve, while Marcos Reynel Hernández in 'El peregrino' (1750-01), a mystical 'Pilgrim's Progress,' and Joaquín de Bolaños in 'La vida de la muerte' (1792), a prose Dance of Death, gave evidence that the

thurch tried to monopolize fiction to prevent its secularization. From a study of the ideas presented in these novels and the circumstances of then publication, the reasons for the late appearance of the modern novel become clear. The novel, as a genre continuously developed, resulted from the concurrence of many historical factors the declaration of independence from Spain, the profamzation of literature, the establishment of a society rich chough to support writers and liberal enough to unshackle them, the rise of an educated class with leisure for reading, and the preoccupation of writers with their immediate environment. When this juncture took place, Mexico's first great novelest, José Joaquín

Fernández de Li arch, came into prominence, Lizardi (1770-1827) looked upon the novel as an effective velnde for the ideas he had previously disseminated in his saturcal periodicals and pamphlets. 'El Periquillo Samiento' (1810) revived the Spanish picaresque novel in order to re evaluate according to new standards all social classes in Mexico, 'Noches tristes' (1818), imitating Cadabio's 'Noches lúgubies' disguised an attack upon the miscarriage of justice, 'La Ouijotita' (1818-19) adapted adapted Rousscau's (Emile) to the needs of Christian Mexican women. (1) Catrin de la Fachenda' (1832) castigated the poor hidalyo type by depriving him of the means for indulging his pride; all served as weapons with which Lizardi sought to defeat ignorance, bigotry, and antisocial conduct. With a wealth of ideas borrowed from Christian moralists and French rationalists. Lizardi waged bitter battle on his conservative opponents and won a victory so decisive that his liberal ideas have had a lasting influence upon the course of Mexican letters.

Mexican romanticists, while giving free play to their lyncism, fantasy, and individuality, erected the structure of the novel upon a base of realism. In doing so they responded to the dictates of Lizardi's realism and rationalism as well as to those of their own temperaments. Though many later novels could be called romantic, only the works of three writers of note properly fall into this category. Fernando Otozco y Berra (1822-51) related a sentimental history of his amours in his only novel, 'La guerra de tres anos? (1850); Florencio María del Castillo (1828-63) wrote several romances of platonic love, of which 'Hermana de los ángeles' (1851) is the best; and Juan Díaz Covarrubias (1837-59), in his 'Gil Gómez' (1858), placed a sentimental tale of disappointed love against the vivid background of the hidalgo uprising. Another novelist, Justo Sierra O'Reilly (1814-61), though not unresponsive to romanticism, in his historical novels, Un año en el hospital de San Lázaro' (1845) and 'La hija del judio' (1848-50), achieved the balance and proportion in plot and characterization typical of classical writers.

After Lizardi realism in the novel did not disappear. The background for romantic novels and the historical descriptions in Justo Sierra's works are realistic. Finally re-establishing its former importance realism becomes the fundamental law in all of Manuel Payno's (1810–94) novels, 'El fistol del diablo' (1845–46), 'El hombre de la situación' (1861), and 'Los bandidos de Río Prío' (1888). Luis G. Inclán's (Astucia) (1865), which, while similar to Payno's

tast novel in subject, does not compare with it in

At the end of the Wars of Reform and Intervention Mexico enjoyed a literary renas-Ignacio M Altamuano (1834-93).through his *Recustas literarias* (1808) and his excellent novels, (Clemenera) (1809), (La navidad en las móntañas) (1870), and (El Zarco) (1888), by precept and practice, encouraged and schooled the artistic efforts of a large group of enthusiastic young writers, including Justo Sierra, the son, Angel de Campo, and José de Cuéllar (1830-94). The latter wrote a series of novels of manners and morals under the general title, 'La Linterna Mágica,' praiseworthy for their humor and precise portraiture. With

Altanurano art had been added to romanticism. Also after 1807 historical novels were produced in givent numbers. Representative, if not the best of the group, 'Calvario y tabor' (1868), illustrates the degree to which historical description and violent action had replaced character creation. The author of this novel, Gen Vicente Riva Palacio (1832-96) achieved contemporary fame, but his war novels are now almost for-

gotten.

By the end of the century romanticism had died out, while realism in the historical novel and the novel of manners strengthened its influence. Four excellent novelists, all realists, then came to the fore Emilio Rabasa's fame rests on a series of four novels (1887–88) which trace the career of a typical small-town politician José López-Portillo y Rojas (1850–1923) painted ranch life in vivid colors in "La parcela" (1902). (1898), described subjectively the rise of a talented artist in 'Los precursores' (1909), and emen arist in "Los precursores" (1909), and examined the question of land distribution in (Frientes y débiles" (1919). Rafael Delgado (1853-1914), a regional novelist, in 'Angelina' (1893), an imitation of Isaacs' (María,' gave Mexico its best romantic novel; then he turned to realism in (1990-1990) and the regional of the second to realism in 'La calandria' (1889-90) and in 'Los parientes ricos' (1901-02) The trend Tos parientes ricos (1901-02) toward naturalism, already apparent in Delgado's later novels, culminated in the novels of Federico Gamboa (1801-1939), whose most famous work, 'Santa' (1903), a Mexican 'Nana,' has long been Mexico's most popular novel. Gamboa, even though he depicted only the miseries of the lower classes, exposed conditions with the skill of a tine reformer.

The novel fell into a state of decline after 1900, and only with the outbreak of revolution in 1910 did the energy to create realistic novels flow again in the veins of Mexican writers. Then began the great period of the novel which has not come to an end. The new novel, the «novel of the revolution» as it is called, is characterized by freshness of view and freedom of expression. It deals with the history of the revolution, its origins, its growth, and its outcome. It is in turn pictorial, picturesque, picaresque. In it social problems, hitherto hidden by the paternal dictatorship of Díaz, are brought into focus for the first time. Two earlier novelists, Salvador first time. Two earher novelists, Salvador Quevedo y Zubieta (1859–1936) and Heriberto Frías (1876–1928), pointed the way for novelists of the revolution by writing historical novels fraught with realistic descriptions and political implications. The latter's 'Tomóchic' (1892), the first novel of political protest, had considerable influence upon Mexican political thought.

The chief contemporary Mexican novelist, Mariano Azuela (1873), at the beginning of the civil war wrote the epic tale of a rebel leader, 'Los de abajo' (1915). Though he has since published many novels of social inquiry, none compares with this vivid picture of revolunone compares with this vivia picture of revolu-tion. (El cartucho) (1931) and 'Las manos de mamá' (1937), delicately lyrical, have placed Nellie Campobello (1912) in the front rank of Mexican novelists. The outstanding novel of Mexican novelists. The outstanding novel of political intrigue, 'El águila y la serpiente' (1928) came from the pen of Martín Luis Guzmán (1887), who is at work on an unusual fictional biography of Pancho Villa Though Rafael Muñoz (1899) writes more exciting tales, Guzmán is unsurpassed in style and sensitive visual imagery. José Rubén Romero (1890), a robust humorist, cultivates in 'La vida inútil de Pito Pérez' (1938) and other novels a kind of writing peculiarly his own, the novel of rural Michoacán Gregorio López y Fuentes (1897) describes in 'El indio' (1935) a primitive Indian village brutally overrun by agents of civilization. Most of his novels deal with the customs of his native Veracruz Out of the sixty or more novelists using the Mexican revolution as a theme or as a starting point for novels of social inquiry, customs, and political dogma, only a few have given up their traditional independence to join either the school of proletarian writers or that of the estridentistas. The former is headed by José Mancisidor, and the latter by Xavier Icaza (1892), an exponent of cacophonous prose. Two splendid books, one of customs, one of character study, have recently appeared: 'Nayar' (1941), written by Miguel A. Menéndez, and 'El paseo de mentiras' (1940), a collection

by Juan de la Cabada

The majority of the novelists of the revolution have ceased to picture the chaos of war and now have concentrated their attention on social changes which it brought in its wake. It is quite likely that they will contribute other splendid novels to modern Mexican literature for which they have already won esteem in the

Americas.

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Under the Aztecs, before 16A. MUSIC. the coming of the Spaniards, music held a pir mary place in the national life. The Aztec Empire was almost a theoriacy in which native priests occupied the positions of greatest power, and there was hardly a single social phenomenon not intimately associated with religious expression. Prayers for rain to help the crops or for victory in battle, ceremonies of thanksgiving, fiestas of offering, dances held in honor of a cer tam god, all of these were sponsored by native priests and all were occasions for group music in which the feelings of the entire folk found expression. Only two classes in the Aztec Empire were supported by the state, the priests and the warriors, and both of these were given a rigorous musical education. Dancing was trequently a part of folk ceremonies and Mexican dancers were trained under a discipline which was demanding in the extreme. These funda mental expressions of the Mexican people continue to take place even today in the countless estas of city and countryside, and in the Indian communities they have maintained much of their indigenous flavor. They have been altered with the passage of centuries, but never destroyed.

Juan de Torquemada (1723) described one

of these ancient folk festivals in great detail. It took place in an outlying district which had not come under the influence of the Spaniards, and no Spanish musical instruments were used First of all, and early in the morning of the fiesta day, a huge straw mat was put in the center of the plaza, and on this the instruments were placed. The musicians then robed themselves in a nearby house of some native noble or elder, and came out dancing and singing. As they reached their instruments, a few Indians blew the signal on shrill whistles and the or-chestra sounded off in a low tone. Its volume gradually increased as more and more people joined the dance. The slow, deep tones used at the beginning of the ceremony were quickened, two leaders started singing, and the chorus of several hundred townspeople soon joined them. The songs were chanted, and as the music and dance progressed they became higher and higher in pitch and faster and faster in rhythm. Young boys singing in falsetto voices added a note of variety to the harmony. The instruments at the beginning of the dance were limited to two drums, a large one called the fluchuell which was played with the hands, and a smaller one called the Teponaztli on which sticks were used. Later on in the score other native instruments took up the chant: clay flutes, small trumpets, numerous bone whistles, and other types of drums. As Carlos Cháves points out, the ammation, force, and thythmic impetus of this native music gave it a vital dominant quality unexcelled elsewhere in the world. It was a type of music which completely dominated its hearers, and the purpose of which was to overwhelm forces of the supernatural world as well with its energy and its insistence. It did not entreat or supplicate, and all of its instruments were of a strong active nature, vigorous, storal, persistent.

With the Spanish conquest a new horizon was opened to Mexican music. Just as the Spanish language imposed itself on the literate and literary people of Mexico, so did Spanish music and Spanish instruments impose themselves on the indigenous music of the Aztecs. This fusion of two faces which resulted in the hybrid mestizo Mexican also resulted in a mestizo music which had to express itself in a new idiom. Native characteristics persisted, of course, but the cultural idiom of the conquering face now dominated the harmony, the rhythm, the

direction, the instrumentation

Only three years after Cortee's captured Mexno City (1521), a Franciscan triar from Flanders by the name of Pedro de Gante had established his school for the natives at Texcoco m 1521. Here about 1,000 Indians were trained in music, singual, arts and crafts, reading and writing, Christianity. They were also taught how to make the new Spainsh instruments, and soon became as adopt as their Spanish teachers in this work. They made organs, guitars of all varieties and sizes called quitarrones, cahuelas, mariachis, guitarras, etc., and also the chirimia, a double reed instrument probably from Asturnes in northern Spain, which resembles the bagpipe of Roman quita. The instrument was derived from the ancient Greek flutes or pipes of Pan. Vihuelas de arco (played with a bow) were also introduced by the Spaniards. Pedro de Cante moved his school to Mexico City in 1527 and continued as its director until his death in 1572.

The first book of music printed in America was the 'Ordinarum' (Ordinary of the Mass) printed in Mexico in 1866. A total of seven music books appeared in Mexico before the year 1600. Our own 'Bay Psalm Book' (first book printed in the United States) came out in 1640 but music was not added until 1690. The Psalmodia Christiana, a group of hymns and psalms translated into the native Mexican language by Bernardino de Sahagún, was printed in Mexico City in 1583. Many books of Spanish music, especially those of the great religious composers, were imported from Spain in the 16th and 17th centuries. Spanish «hynns of the Virgin which do not greatly resemble the austere and often doteful frymms of Puritan Protestantism later became the basis (musically speaking) of most of the Latin American national anthems of the early 19th century when the struggle for independence took place.

One of the most important forms of mestizo folk music in Mexico was the corrido or ballad. The term corrido is Andalusian and the ballad itself is modeled on the romance of Spain, using assonance instead of rime. Mexican corridos tell stories of everything under the sun: revolutionary exploits, the first locomotive, the new town school, the love affairs of some ruffian or hero, in a word, anything in the public eye. The harmony is simple and seldom departs from the tonic, dominant, or subdominant chords. Accom-

paniment is on the guitar. One Mexican folklorist has enumerated 33 different kinds of corridos, and there are probably more. Old singers, especially beggars, sometimes know hundreds Other forms of Mexican folk music are the

zandunga, a slow, sentimental song and dance from the Isthmus of Tehuantepec (Oaxaca), the jurabe or jurabe tapatio, such as the «Mexican hat dance" or the "dance around the bottle," which recall the Spanish segudilla, fandango, and jota, the jarana of Yucafan with much heel-work and playing at bullfighting; the huapango, especially popular in the state of Vera Cruz, also with much use of the heels and of strong Andalusian thythm Huapangos are danced on wooden platforms like the ancient Aztec mitales, to which they hear some resemblance. Other songs and dances are the alabado or "song of praise," the dreamy canacuas of Michoacan, the lively chiapanecas with its handclapping, songs of the Revolution like la cucaracha and la Adelita, and many others. In some parts of Mexico (Michoacán, Jalisco, etc.) stringed instruments such as harps, violins, guitars, and whiclas known as mariachis, are used But in Yucatán the jarana players use cornets, drums, and gourds. There is a folk orchestra at every Mexican railway station, and several at every fiesta, ready to play any one of dozens

of selections for a few pennies.

In contemporary Mexican music by known composers three very distinct trends are outstanding first, composition in the European tradition with only slight native influences which we find in the works of Manuel M. Ponce and José Rolón; second, the «nationalist» group which is inspired by native traditions but which composes in a highly personalized manner, as for example Carlos Chavez and Silvestre Revueltas, third, those "radicals" who greatly admire Arnold Schoenberg and the atonalist school Among these the Mexican Julian Carrillo, who was trained by German teachers, has composed several pieces with intervals smaller than the semitone. Of the three groups the second or nationalist school is the most important Under the direction of Chavez in 1931 the National Conservatory and the Department of Fine Arts of the Division of Public Education obtained enough native instruments to found the «Mexican Orchestia» This musical organization uses all of the instruments brought to Mexico from Europe by the Spaniards, as well as all those of the ancient Mexicans. Chavez points out that the presence of these Aztec instruments «gives such force to the ensemble that the other instruments are completely transformed.» In the actual work of composition Chavez has utilized many Aztec themes, and Revueltas has based many of his pieces on corridos. They have brought a new vigor to Mexican music, have re-established the pride in race and native culture which was for so long in eclipse, and have given to mestizo musical expression of the present day a fullness depth, and richness which has already voiced itself in many fine symphonic pieces and which promises many more for the future
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17. HISTORY. Pre-Conquest Period.—

The history of Mexico devides itself into three parts. aboriginal Mexico under the domination of its native Indian rulers, from the border land of prehistoric times to 1521; Spanish occupation from 1521 to 1821 and independent Mexico from 1821 to the present.

A score of distinct aboriginal tongues and more than 100 dialects still spoken within the confines of the Mexican Republic are evidence of the presence of numerous races that overran the country at various periods during its prehistoric existence. These early races seem to have had considerable influence upon the traditions, mythology and customs of the people who followed them in the country. From the confused movement of the shadowy peoples of the past stand forth the forms of several more or less distinctly cultured races whose written and traditional records, legends and folklore reach back to the dim border land beyond which all is mythical. During the early semihistorical part of this period the great Nahua race, beginning its many years of wandering from the north, crossed the Mexican boundary in the 6th century and continued southward. These migrations were participated in by numerous tribes or nations. The first of these, the Toltecs, came from the semi-mythical land of Old Tlapallan under the leadership of their high priest and lief, Heumatzin, he of the big hands, and arrived at Tulancingo (a short distance north of Mexico City) in 720, after 176 years of wandering. Soon afterward they established populous centers at Tula, San Juan, Tentihyacán, Chalula and Tumerous other Teotihuacán, Cholula and numerous other places and extended their power over a wide reach of country They are said to have been a highly civilized race, to have been builders of great and handsome cities and to have extended organized commerce for hundreds of miles beyond their own territory which, at the height of their power and prosperity, stretched from the Gulf of Mexico to the Pacific and far southward to the border of the domains of the Maya of Yucatán, Chiapas and Campeche. They had a settled form of government and complicated, far-reaching codes of law which included military, political, social and religious regulations, and these, in their turn, were supported by racial customs and dogmas. See MEXICO — MYTHOTOGY, MEXICO — LITERATURE

While the Nahua held the central portion of what is modern Mexico, the Maya and other kindred races occupied the south, stretching from Campeche, Yucatan and Chiapas south and west to the Pacific and into Guatemala, where they established a civilization rivaling that of the Toltees Between the Maya on the south and the Toltees on the north lay the Zapoteca and the Mixteca, almost as far advanced as they in the arts and sciences and the principles of government. All four peoples were skilled workers in metals and excellent makers of pottery and woven fabrics. They recorded their histories, traditions, religious formulas, tribute rolls and important events in complicated hieroglyphies which varied with the different races. They were good agricul-tinists, excellent builders and organizers and they maintained extensive and well apportioned armies and systems of public instruction. All education was in the hands of the priests and administered from the temples, thousands of which, rising from high, truncated, pyramidal structures, covered the land. These temples were specially numerous and of notable mag-nificence in the Aztec land and Yucatán See MEXICO - ARCHITECTURE, MEXICO - ART

Civil wars, internal dissensions, famine and plague are given as the causes of the distription of the Toltec empire which came to an end in 1116, after nearly 400 years of existence. A part of the Toltec population is said to have migrated southward and to have entered the land of the Maya. It is certain, however, that many remained behind and lost their identity in the Chichimeca and other less cultured races who occupied the valley of Mexico and surrounding country. From this union sprang the famous Texcocaus, whose capital, Texcoco, on the lake of the same name, preserved the civil ration of the early Nahua and finally became the most noted centre of culture in the Mexican

empire.

The Aztecs, Texcocans, Tepanecas, Chalcos and Tlaxcalans are the most notable of the Nahuatl tribes who took possession of the country deserted by the Toltecs. Of these the most important are the Aztecs, who began their wanderings from Aztlán, their old home in the north, about a century after the Toltecs. Six hundred years later they arrived in the valley of Mexico, where they eventually, after many struggles and privations, established themselves on two little islands in Lake Texcoco, and founded their capital, Tenochitlán, the Place of Tenoch, their priestly leader and mighty warrior, or Mexico, the Place of Mexitli, their war god.

The Aztecs prospered, grew in numbers and extended their power over the Chalcos and other tribes bordering on the lakes of the valley of Mexico and, forming an alliance with the Texcocans and the Tepaneera, carried their conquering arms from the Gulf of Mexico to the Pacific and, from some distance north of Mexico City, southward past the Isthmus of Tehuantepec almost to the border of modern Guatemala, where they encroached upon the land of the Maya. The creation of this vast

empire which, in extent and power, outrivaled that of the Toltees, was due to the skill, intelligence, executive ability and warlike prowess of a line of kings which began with Acamapitzin, Prince of the Reeds (1370-1401), 50 years after the founding of Tenochtitlan. The other Aziec rulers in succession, up to the arrival of Cortés, were Huitzihhintt, Hummingbird's Feathers (1404-17), Chimalpopoca, Smoking Shield (1417-27), Excoatl, Obsidian Kinfe (1427-40), Mocteziuma I, Wrathy Chief (1440-60), Axayacatl, The Fly (140-81), Tizoc, Laine Lee, (1481-80), Aliuzott, Water-rai of whom worked zealously for the upbuilding of the Aztec empire and the beautitying and

extension of their capital

From the beginning of the reign of Moctezuma II. Spanish navigators had been exploring the neighborhood of the Mexican coast and several had touched on the mainland of Yucatán and Campeche. In 1519 Hernán Cortés. inspired by the dream of conquering a great and rich land, of which reports had been brought to Cuba, set out with a small military force on his daring expedition to the uplands of Mexico. On the way he defeated the Tlaxcalans, an independent nation, and the Cholulans, who formed a semi-dependent province of the Aztec empire. From these he recruited a considerable native army, with which he contimued his march to Mexico City, where he was reluctantly received by Moeteziuma II and quartered in one of the royal palaces. He finally succeeded in making a prisoner of the Aztec ruler, who was killed a short time afterward (30 June 15.20) either by the Spaniards or by the Mexicans themselves. The presence of the Spaniards in the city, the death of the emperor and the profanation of the shrines of their deties enraged the Aztecs to such an extent that they rose against Cortés and he was forced to leave the city by might. In the retreat he lost his cavalry, artillery and most of After recruiting a new army and his intantry obtaining additional war equipment, Cortés returned and laid siege to the City of Mexico which he captured (13 Aug. 1521) and afterward continued the conquest of the domains of the Moctezumas.

Under Spanish Rule. Immediately after the surrender of Tenochtitlán the government of Mexico tell into the hands of the conquistadores who, being purely military governors, administered the affairs of the land by means of military law. Gradually the large cities were granted local government similar to that of Spain and the province was divided into districts controlled by the central government in Mexico City. In 1528 auditors (oidores) were introduced to keep a check on the captain general, Cortés. They soon succeeded him and continued to govern the country until 1535, when Antonio de Mendoza became the first viceroy. He was a very carnest and capable man and at once proceeded to replace with an orderly and settled form of government the hap hazard methods of the oldores and military leaders.

Spain monopolized the trade of Mexico, or "New Spain" Commerce to and from the colony could be carried only in Spanish bottoms; nothing was permitted to be grown in Mexico that might in any way come into com-

petition with products from Spain Only native-born Spaniards could hold office under the government in New Spain. The establishment of manufactures of all kinds was dis-comaged or prohibited. Yet Spain gave her colonies a strong government and one that was thoroughly understood by the mass of Indians and mestizos who composed the greater part of the population of Mexico, for it was much like the kind they had been accustomed to for centuries under their native rulers. The encomagement of literature and art, the beautitying of the cities and towns, the extension of great highways of commerce, the improvement of harbors, the establishment of high schools, colleges and a provincial university and the practical eradication of the native religion with its human sacrifices were far-reaching benefits which Spain bestowed upon Mexico evils of her administration outian the good The establishment of peonage and the concentration of the Indians in centres, towns, camps or ranches under the pretense of civilizing and Christianizing them soon destroyed all the ma-chinery of the native civilization. The masses of the population, their aboriginal laws and codes of inotality gone by the board, soon lost their pilde of face and descended to a condition of slavery bringing with it debauchery, a loss of interest in life and a consequent loss of ambition. These and scores of other abuses created discontent throughout the viceroyalty, which was destined to show itself in vigorous protests and insurrection against Spanish au-An unsuccessful revolutionary plot in the capital in 1808 was followed by the uprising of Hidalgo, the patriot priest of Dolores, on 16 Sept. 1810 Hidalgo, after a wonderfully successful initial campaign which brought him, with an army of 100,000, almost to the gates of the capital, was finally defeated, captured and executed the following year. The war of liberation dragged on with varying success until 1821, when the life of independent Mexico

Independent Mexico.—The first government of independent Mexico consisted of a council of six, with Gen Augustín Iturbide, the commander of the revolutionary army, as president. On 19 May 1822 Iturbide was proclaimed emperor, and on 21 July he and his wife were crowned in the cathedral of the capital. But dissensions soon set in and Iturbide was forced to abdicate and to leave the country. On returning to Mexico in 1824 he was arrested, tited and shot as a traitor. Then followed many kaleidoscopic political changes in which the personal ambition of military leaders played the

foremost part.

Santa Anna, who became President in 1833, and who was looked upon as a good soldier, took the field against the Texas revolutionists with an anny of 6,000 trained men Successful at first, he was defeated in 1836, captured and taken to the United States, but was allowed to return to Mexico the following year. For more than a generation, from the first days of the republic to the middle of the 19th century, the figure of Santa Anna appears ever in the foreground of the political life of Mexico guiding the destinies of the nation or watching political moves from either voluntary or forced retirement. Shortly after his return from the United States the French government sent a

squadron to Vera Cruz to enforce the payment of claims against Mexico held by French citizens Santa Anna, who had gone into one of his periodical retirements, came forth and placed himself at the head of a force to oppose the French, who finally withdrew Santa Anna claimed the honor of having driven them from the country. This claim and the fact that he lost a leg in the encounter made him once more a national figure and a popular hero, although Mexico had been forced to comply with the French demands

Bustamante, recalled from exile, became President in 1837, on the outbreak of the revolution in Texas The struggle between ambitious military leaders became more intense. Santa Anna, Paredes, Bustamante, Farías. Herrera, Nicolás Bravo and others played their several parts on the constantly changing stage. The admission of Texas to the American Union as a State, 29 Dec 1845, roused the resentment of Mexico against the United States to a high pitch James K Polk, who succeeded Tyler as President of the United States, was an ardent expansionist and included in his plan of expansion the acquisition of California, Arizone and New Mexico, then Mexican territory Claims amounting to several million dollars were held by American citizens against the Mexican government, which was unable to meet them Polk proposed to settle these claims in exchange for Mexican territory, paying, in addition, to Mexico \$25,000,000 in cash In November 1845, John Slidell was sent as diplomatic representative to Mexico City, with instructions to press the matter of cession of Mexican territory to the United States the Mexican authorities, having learned in advance of Shidell's commission, did not receive him. Polk was ready to ask Congress to declare war against Mexico in May 1846 when the news reached Washington that armed Mexico in May 1846 when the new 1846 when the new 1846 when the new 1846 when the new 1846 when the new 1846 when the new 1846 when the new 1846 when the new 1846 when the new 1846 when the new 1846 when the new 1846 when the new 1846 when the new 1846 when the new 1846 when the new 1846 when the new icans had already crossed the border and killed a number of Americans. War was declared against Mexico, 13 May. General Taylor, in command of American forces on the Rio Grande, was ordered into Mexico. In September 1846 he defeated a Mexican army and captured Monterey and, on 22 February, he fought a drawn battle at Buena Vista (Angostura). A month later Gen Winfield Scott arrived at Vera Cruz, which he captured, 29 March, and began the long and toilsome march toward the upland plateau and the capital of Mexico, which he reached six months later After the capture of Molino del Rey, Churubusco and Chapultepec, fortresses defending the capital, Scott's army entered the City of Mexico. In the meantime American forces had taken possession of California and New Mexico without opposition. In February 1847 a treaty was signed at Guadalupe Hidalgo, near the Mexican capital, between representatives of Mexico and the United States by the provisions of which California and New Mexico were ceded to the United States.

Santa Anna, who had again become dictator of Mexico while the country was at war with the United States, retired to Jalapa, and General Herrera became President, 3 June 1848. He was succeeded (January 1851) by General Arista, who was forced out of office by Santa

A new constitution for the republic which

became law on 5 Feb. 1857 figured in every Mexican conflict during more than half a century President Comonfort repudiated it, thus estranging his own following without gaming the support of his opponents. He was forced to flee the country, and his departure gave 11se to internal dissensions not finally settled for years. Benito Juárez, president of the Supreme Court, claimed the presidency in accordance with the provisions of the Constitution Wat divided the people and devastated the land and the reactionary party forced Juárez from the capital. In the midst of all this civil trouble, a real danger threatened the republic from without. In 1861 England, France and Spain entered into an agreement known as the Treaty of London, by which they were to send a threefold fleet to Veta Cruz to demand of Mexico guarantees for the payment of her foreign debt and for the safety of their subjects in Mexican territory. This fleet, which appeared at Vera Ciuz on 8 Dec. 1861, captured the port and proceeded to Orizaba, where a conference was held with Juarez, who agreed to comply with the demands of the powers. England and Spain at once withdrew their troops from the country But the French, who had a secret understanding with the Mexican reactionary party, at the head of whom was Miramón, who had disputed the presidency with Juarez, re-mained in Mexico with the avowed purpose of settling its social and political difficulties. The French army soon began its march toward the uplands, but it was defeated before the walls of Puebla and forced to retreat to Orizaba (1862).

The Archduke, Maximilian of Austria, and his consort, who had been selected by Napoleon III as emperor and empress of Mexico, arrived in Vera Cruz 24 May 1864 In the capital they were welcomed and crowned with great ceremony. The protest of the United States forced the withdrawal of French troops from Mexico, and Maximilian, left to his fate, was compelled to surrender at Queretaro in 1867. He was tried, found guilty of treason to the Mexican people and shot on the Hill of the Bells near Queretato, together with his two generals, Miramón and Mejia, 19 June 1867. The concerted action of the Army of the North under Escobedo and the Army of the East under Porfisio Díaz defeated the Imperialists; Mexico City surrendered to Diaz 21 June, two days after the execution of Maximilian; and on 15 July Juárez returned to the capital amid the rejoicing of the populace. But opposition to the Juárez government soon developed and his administration was troubled by constant uprisings and disaffection. Juárez died suddealy 19 July 1872, shortly after he had been re-elected President. He was succeeded by Schastian Lerdo de Tejada, who served one term and was forced out of office shortly after his re-election by Gen. Porfirio Diaz who defeated the Lerdist party at the battle of Tecoac, marched upon the capital and was there proclaimed provisional President, 24 Nov. 1876, and later constitutional President. At the expuation of his term of office, 30 Nov 1880, he was succeeded by Gen. Manuel González, who continued the Diaz policy of encouraging the construction of railways and increasing the efficiency of the rural police charged with the protection of the country from revolutionary and robber bands

Diaz succeeded González in the winter of 1881, and, for more than a quarter of a century, he continued to be the one great power in Mexico. He found the country in debt and the income of the administration madequate to meet the demands on it. He increased the revenue of the nation over 400 per cent; he built railways, highways, roads and harbors; he drained the valley of Mexico and made the pest ridden coast towns places of resort. He encouraged foreigners to settle in or invest in the country and to contribute their part to his program of expansion and development, and he created a credit for the nation and steadily mereased and improved it. He introduced system and encouraged honesty in the public service and prevented, to a very great extent, malversation of public funds, which had been so noticeable during previous administrations, by the introduction of a riend and modern system of accounting and by holding the heads of the departments accountable for the funds passing through their hands. With Diaz the Indian and mestizo elements, constitutum, fully 85 per cent of the population, began to come into their own. Thus a new social life was created in Mexico under his régime, and in it the mestizo, for the first time, began to play a prominent

Diaz found public instruction neglected and practically non-existent and he set to work to remedy this detect. Training schools for teachers were established and the higher schools and colleges were mereased and improved with a view to supplying, through them, the teaching body for new primary and secondary schools. Though lack of funds hampered this work, the results achieved hore truit in the rapid increase of the standard of intelligence in the larger towns and cities. Under Diaz the resources of the country were developed; commerce threw off its provincialism and became national and international, and new industries sprang up throughout the land. But, with a government which had absolute control of the affairs of the country so long as that of Diaz, abuses were bound to creep in. About the President had grown up a strong personal party the members of which, while professing intense admiration for him and his povernment, succeeded in enriching themselves, their relatives and friends through concessions and privileges secured through their close connection with the administration. The spread of public instruc-tion and the rise of the Indian and mestizo to public prominence introduced into the political equation a new and restless element which Diaz had constantly, throughout his long régime, to curb, control and discipline. The discontent increased; Mexican exiles in the United States used every means in their power to hasten the overthrow of the man they characterized as autocratic and tyrannical. Ramón Corial, the Vice-President, who was looked upon as the leader of the sinister influence at work in the party surrounding the President, was singled out as the special object of attack of the anti-government agents. Diaz, in the face of the impending storm, supported Corral who was re-elected in 1910. During the month of September 1910 the 100th anniversary of the declaration of Mexican independence was celebrated

throughout the republic with great pomp and ceremony and special representatives of for-eign nations gathered in the capital to lend dignity to the occasion. But scarcely had the month of national rejoicing ended when politcal unrest began to show renewed activity. Francisco I Madero, who had presented himself as a candidate for the presidency in opposition to Diaz and had been arrested on the charge of sedition and finally released from prison and ordered to leave the country after the elections had been held, furnished the necessary leader to the Liberals in the United States and their many sympathizers in Mexico active revolutionary propaganda already begun was intensified, and agents of the insurgent party spread their doctrines throughout Mexico and induced upusings in Vera Cruz, Puebla, Chilmalma, Durango and other cities and towns of the republic; and, as Madero crossed the border to head the insurgents, similar outbreaks took place south of Mexico City, while revolutionary bands gathered in force in the north near Torreón, Gómez Palacio and Partal The inauguration of Díaz as President (1 Dec. 1910) increased the revolutionary centres and quickened their activities, thus compelling the government to weaken its strength by distributing its forces over a large and constantly increasing area of territory Radical changes were effected in the Diaz Cabinet and attempts were made to meet the demands of the revolutionists, as American troops were ordered concentrated along the Mexican border; for this move was taken in Mexico to mean a threat of intervention. The government offered to enter into peace negotiations with the insurgents, but attempts made to this end proved abortive and were suspended 6 May Tuárez fell to the insurgents 10 May, and Diaz, urged to save the country from further bloodshed and the danger of intervention, resigned, 25 May, and was succeeded in office by Francisco de la Barra, Secretary of Foreign Affairs, as President ad interim pending an election. Two weeks later Madero entered the capital where he was enthusiastically received. So powerful was his influence that the de la Barra administration was forced to consult him in every important move made On 15 November Madero was unanimously elected President of Mexico; but scarcely had he assumed office when opposition began to develop and revolutionary intrigue to show itself within his own party Zapata revolted in Morelos and Gen Bernardo Reyes attempted an unsuccessful insurrection Gen. Pascual Orozco, one of the foremost revolutionary leaders, rebelled and captured Juárez 12 Feb. 1912 Gen Félix Díaz took Juárez 12 Feb. 1912 Vera Cruz, but was himself captured, tried and condemned to be shot —a sentence which was commuted to confinement in the penitentiary near Mexico City In the meantime Madero found himself unable to control those who surrounded him, to establish a stable government or to carry out the promised reforms
General Mondragón, backed by his own

General Mondragón, backed by his own troops and the students of the Military Training School at Tlapam, a suburb of the capital, rose against the government, 9 Feb. 1913, marched to the military prison and set free General Reyes, and from there to the penitentiary and liberated Gen. Félix Díaz. Practically unopposed the three generals entered the

capital, where Reyes was killed in an attack on the National Palace. The revolutionists seized The Citadel, a strong fortress and ammunition depository, while the Madero forces took pos-session of the National Palace, Chapultepec and other points in and around the city. Both factions bombarded one another almost continuously for 10 days, when Gen. Victoriance Huerta, commander-in-chief of the government forces, brought the conflict to a dramatic close by the seizure of President Madero and Pino Suárez, the Vice-President, who were forced to resign their respective offices. Pedro Lascurain, Minister of Foreign Relations succeeded to the presidency He appointed Huerta his minister of foreign relations and resigned in his favor Thus, in one day Mexico had three Presidents. On the morning of 23 February Madero and Pino Suárez were murdered, presumably by agents of the Huerta government. For this act, Venustiano Carranza, governor of Coahula, disavowed the new government and issued the Plan of Guadalupe which called for reforms in the administration, equitable taxation, extension of the educational system and the solution of the land problem (March 26). President Wilson dispatched John Lind to Mexico City as his personal representative with a view to bringing the opposing parties together; but Huerta's refusal to be eliminated as a presidential candidate and his airest and imprisonment of 110 Congressional deputies and the forcible dissolution of stonal deputies and the forcible dissolution of Congress (10 and 11 October) made any compromise impossible A new election held on 26 October, under pressure, resulted in the selection of Huerta as President. The new Congress, which met on 15 November, in view of a protest from Washington, declared void the election of the President and Vice-President but confirmed Huerta in the office of provisional President. The Constitutionalists determined to make no compromise with Huerta, and the war went on. Villa took Juárez 15 November, other important places fell and early in 1914 Villa captured Ojinaga, after the Federal garrison of 4,600 had retreated across the American border Then Villa took turning southward he took Torreón in April, while Mazatlán and Tampico surrendered to the Constitutionalists in May, and Carranza set up his government in Salullo.

Huerta found himself in constantly increasing difficulties on account of his defiance of the United States. These difficulties had culminated when sailors from the United States steamship Dolphin had been arrested in Tampico 10 April and marched through the city under armed guard. For this insult Admiral Mayo demanded that the Mexican government should order a salute to the American flag. This Huerta refused to concede; and President Wilson laid the matter before Congress 20 April, requesting authority to use the forces of the nation to enforce Mayo's demand. While Congress was debating this request American marines were forcibly landed in Vera Cruz to prevent the entrance at that port of a shipment of arms from the steamer Ipiranga. At this juncture Argentina, Brazil and Chile, known as the A B C powers, offered to serve as mediators. The offer was accepted and the diplomatic representatives of these powers at Washington met at Niagara Falls, Canada, 20

May to 24 June, without being able to find a solution for the troubled conditions in Mexico On the day they adjourned Gonzáles took Zacatecas and, two weeks later, Obregón entered Guadalajara, and in July, San Luís Potosí, Manzanillo and several smaller places fell to the Constitutionalists. Huerta, forced to resign, 15 July, was succeeded by Francisco Carbajal, Minister of Foreign Relations, who at once entered into communication with the Constitutionalists and resigned in favor of Carranza, 13 August. Two days later Obregón took possession of the capital, where Carranza arrived on 20 Aug. 1914

With the elimination of Huerta and the success of the Constitutionalists, bitter dissensions appeared in the heterogeneous elements composing the party A convention of generals called to meet in Mexico City on I October served only to intensify the trouble and the convention was moved to Aguascalientes, where, dominated by Villa, it disallowed the claims of Carranza and elected General Gutiérrez provisional President. It was also decided to march upon Mexico City and compel Carranza to yield to the will of the Convention. In the face of this threatened danger, the latter went to Puebla and, from there, to Vera Cruz on the withdrawal of the American forces from Mexico 23 November Zapata and Villa at once occupied the capital and Gutiérrez set up his government there (3 December) In January 1915 the Convention, disowning Gutiérrez, proceeded to govern Mexico City in its own name; but the approach of Obregón with a strong force compelled it to abandon the capital, which was occupied (28 January) by the Carranza commander, who, in turn, was forced to retreat before a Zapatista horde, 10 March Two weeks later Villa recognized as convention I provisional President Gen. Roque González Garza.

One of the dramatic incidents of the year was the siege of Naco, Sonora, by General Mayortena. Five Americans were killed and 50 or more wounded by shots coming across the border Washington warned both the contending parties to retrain from fitting into American territory Early in January General Scott, representing the American government, and Villa held a conference at which it was agreed to withdraw the contending forces from Naco In the meantime the Convention, party was faring badly in the north. Guadalajara fell to Carranza and Villa was defeated at Celayo in March. Other disasters followed and finally Washington notified the Constitutional and Convention parties, 2 June, that unless peace was restored soon, the United States would be tompelled to support some man or group of men capable of bringing order out of chaos-Meanwhile raids were being frequently made across the Texas border by bands from Mexico instigated from without Mexico by certain predatory interests, and finally, on the night of 9 March 1916, an armed band of Villistas attacked Columbus, N. M, killing eight soldiers and a number of civilians. Washington at once acted, 17 March, and sent into Mexico 12,000 troops under General Pershing with orders to take Villa dead or alive. Carranza refused a request from the American government for permission to ship, over the Northwestern Kailway, supplies to Pershing's forces which were finally

compelled to come to a halt at Parral, where several American soldiers were killed and others wounded in a surprise attack

In April General Scott, cluet of staff, who had been sent to the Mexican border to report to Washington on the situation, held a conference with General Funston, commander of the American to ces on the frontier, and General Obregón, Mexican Minister of War The latter insisted on the withdrawal of the American puntive expedition from Mexico, and this was conditionally agreed to, 2 May. Carranza, charging the American government with bad faith and asserting that the presence of United States troops in Mexico proved a constant source of mutation and weakened the hands of the Mexican authorities, refused to ratify the agreement Washington replied by reviewing the course of events in Mexico and charging that the Mexican government apparently did not wish to see the border raiders captured On 18 June the American militia was ordered to the Mexican border two days after General Treviño had been enjoined by Carranza to prevent the movement of the Perslang expedition in any direction except homeward and to oppose the entrance of further American troops into Mexico. In pursuance of this order an American force of come 90 troopers was attacked at Carnzal and a number of officers and troopers killed and 17 taken prisoners. On a peremptory demand from Washington the latter were released, ?? June 1916. Carranza began to show a more triendly front, and proposed the naming of commissioners by the American and Mexican governments to consider the issue between them, 12 July This proposition was accepted and Tans Cabrera, Minister of Finance, Ignacio Bondlas, Minister of Communications and Alberto Pani, head of the National Railways, representing Mexico, met in New London, Coun., with Franklin K. Lane, Secretary of the Interior, Judge George Gray and Dr. J. R. Mott. After many subjects had been discussed Carranza declined to approve any form of agreement, and finally the troops of the United States were withdrawn from Mexico without having accomplished any definite result.

A constituent assembly whose members were chosen at elections supervised by the Carranza army met at Querétaro. That assembly made radical changes in the constitution of 1857 which were promulgated on 5 Feb. 1917 and went into operation 1 May 1917. This provided for the democratization of the Judiciary, free justice without court costs, and created a labor code providing for a minimum wage, compulsory profit-sharing, a free employment bureau and protection against trusts. It also provided for confiscation by the government of churches, schools and hospitals in the possession of religious bodies; and that all clergy be native born. A congress was elected and began its sessions on 15 April 1917, on which occasion President Carranza declared that the nation would continue to be neutral in the European conflict. During the European War many Germans fled from the United States to Mexico, and these were accused of fomenting trouble for the Entente. General charges were made in the United States and in Britain, usually by capitalists interested in Mexican mines or their agents, that Mexico, notwithstanding her proclaimed neutrality, was secretly encouraging the Germans However, the connection of the Mexican government, if it ever existed, with this movement, has never been proved. From 1917 to 1919 there was friction between the Mexican government and the foreigners resident in the country over taxes and restrictions placed on mining and oil properties m the republic, both of which national assets the government rightly aims at nationalizing and protecting for exploitation by predatory foreign corporations. In 1916 the national curency was rehabilitated so as to give it a recognized and regular standard of valuation In 1919 President Carranza issued a public statement that, in conformity with the provision of the constitution which prohibits re-election for second term of the chief official of the republic, he would not again be a presidential candidate. Civil war broke out again in May 1920 Carranza fled from the capital and was assassmated. Adolto de la IIuerta was made Provisional President. At the elections later in the year General Obregón was elected President. He enjoyed a comparatively peaceful term of office, with such revolutionary enterprises as were easily suppressed. Plutarco Elías Calles, who succeeded General Obregón as President, and served 1924-28, began his administration as a fervent reformer, and under him the Mexican educational system achieved perhaps its highest distinction, guided by the master hand of Moisés Sáenz, the nation's foremost educator. Calles, during the latter part of his term, how-ever, went the way of many reformers and became a plutocrat of the first water, an owner of great plantations, factories, business houses, and allegedly of gambling dives of iniquitous reputa-tion. After Calles there was a period of about six years during which the ex-President practically ran the country like a private business. He was accused of putting hand-picked appointees in the presidential chair with the greatest of ease. Portes Gil (1928-30), Ortiz Rubio (1930-32), and Abelardo Rodríguez (1932-34), were accused of having made the national government of Mexico the nation's most powerful vested interest. Portes Gil was charged with suppressing civil liberties with a hard hand; Ortiz Rubio was accused of fostering graft with a flaunting disregard for the national welfare; and Abelardo Rodríguez, one of Calles' former business associates, and reputed to be the wealthiest man in Mexico, was charged with persecuting the Catholics and all political opponents with considerable violence and bloodshed As the nation reacted against this tumultuous régime which closely approached fascism, Calles was almost forced to support the candidacy of in the 1934 elections. Cárdenas Cárdenas was neither an extreme leftist nor a «Calles man,» and from 1934 to 1940 there ensued a period of fairly efficient and decent national government.

Soon after the election of Cardenas, it was plain that he would not do the bidding of ex-President Calles, and the two abruptly split. Cárdenas established a coalition government of all the parties, and quickly won popular support. Former belief that the army was behind Calles was proved to be a myth, and the ex-President was unceremoniously placed on a plane and shipped off to the United States. Cárdenas then commenced his vast program of reforms. He

finished paving the Pan American Highway almost to the border of Guatemala, built hundreds of small schools in the outlying Indian districts, brought water and sanitation and medical care to nearly 500 communities which had formerly been without, expropriated the foreignowned oil wells when their management refused to abide by Mexican labor laws, and restored civil liberties to all parties. Throughout his term the Fascist press of Mexico attacked him violently, but Cárdenas refused to answer with violence

It is perhaps Cárdenas' proudest achievement that during his administration over 40,000,000 acres of land were expropriated from their wealthy owners and distributed to co-operative ejido groups The owners were supposed to receive compensation but the perennially empty Mexican treasury seldom made more than token payments. At the end of Cárdenas' term of office in 1940, 50 per cent of all Mexican workers shared in the ownership of some land as contrasted with the 1910 figures at the end of the regime of Porfirio Díaz when less than 2 per cent of the population owned approximately 85 per cent of the land

The election of Avila Camacho in 1940 rep-

resented a change of policy which promised to carry the nation more toward the conservative side of the fence Foreign capital was again invited to Mexico, and the President openly announced that he is a «believer» in the dogma of the Church Under him the national government no longer closed churches, banned religious orders, proscribed Church education, drove priests from office, or harassed Catholics as it had sometimes done in the past. Under Calles persecution of the Church was the openly avowed policy of the government, under Lazaro Cárdenas restrictions were gradually lifted, and under Avila Camacho this lifting of oppressive restrictions continued. Priests now go about their work unmolested However, the Church is still prohibited from owning real estate, and the number of priests is still strictly limited by Mexican law (1 to every 45,000 inhabitants). Nevertheless, the Archbishop of Mexico City called on all Catholics to support President Camacho and there began an era of religious peace.

After 1920 the Mexican attitude toward labor changed completely The Mexican Revolution of 1910-17 was the only Latin American revolution which resulted in a complete change in the ruling class. Other revolutions changed one politi-cal party for another, but in the Mexican Revolution the «underdogs» or los de abajo, as they were called in Spanish: the Indians, the mestizos, the peones, the laborers of all kinds, in a word, the dispossessed masses in generaloverthrew the landowning class, took their property, and established themselves in power. The constitution of 1917, not always followed but one of the most liberal documents ever written, guarantees labor equal rights with capital, makes collective bargaining mandatory, prescribes conditions of work, minimum hours and wages, proper insurance, and workers' compensations of many kinds In case of a labor disagreement the government itself closes the business institution or factory involved and keeps it closed until a settlement has been reached. As President Cárdenas once remarked, «The government is the arbiter and regulator of social life.» As a result of labor's sudden and almost meteoric rise to power there have been periods of considerable racketeering. During the Calles regime under Lius Morones and his CROM, labor was dictatorial and violent. Under Lombardo Toledano's CTM (Confederation of Mexican Workers) during the regime of Lázato Cárdenas, labor excesses were curbed, and under Avila Camacho, elected in 1910, there was a linther swing toward the right

During the decade 1930 40 Mexican international relations became increasingly important, and at the Pan American congresses of Montevideo (1933), Buenos Aires (1936), and Lima (1938), the Cambbean nations followed Mexico's lead on many points. During the Sandmo re-bellion in Nicaragua (1926-28) against United States investors and marines, Mexico seut munitions and food to the Sandino side and did much to foster the idea that he was a great "patriot" and leader of his people. This foray into Central America cost the United States over \$5, 000,000 and the lives of 135 men out of 5,821 sent to the Central American republic.

Mexico proclaimed the policy of recognizing any government on a de facto basis as soon as it came to power, and thus attempted to urge the United States in the direction of absolute nonintervention in Latin American affairs for whatever reason. This policy was accepted by the United States at the Pan American Congress

of Buenos Aires in 1936 During the Spanish Civil War (1936-38) Mexico was the only Latin American country to openly espouse the cause of the Loyalists against Franco, and she offered refuge to many thousands of escaped Loyalists after the war was over. Many of these people had been intellectual and cultural leaders in Spain and so added substantially to Mexican culture.

In 1939 President Cárdenas vigorously announced his support of the Alhed cause against Germany, and under Avila Camacho in December 1941 Mexico immediately followed the United States' declaration of war by severing diplomatic relations with the Axis powers.

Public graphy: (A. Haudhols et Marriag)

appomatic relations with the Axis powers

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18. DIPLOMATIC RELATIONS OF THE UNITED STATES WITH MEXICO. Farly relations were largely determined first by the Mississippi question and later by the failing to define the western limits of Louisiana in the freaty of 1803 and consequent friction with Spain after 1805

The American government viewed with sympathy the Mexican revolutions, beginning in 1810, and later accorded belligerent rights to the revolutionary government which was aided by filibustering expeditions from the United States: but it endeavoied to maintain neutrality until 1822 when, after the final ratification of the Florida Treaty with Spain, it recognized Mexico as an independent state whose government promptly opened Texas to American im-

migration.

At the close of 1822 losé M. Zozava was accredited first Mexican Minister at Washington, but the real beginning of the Mexican legation dates from the arrival of Pablo Obregon in November 1824 In March 1825, the American government sent Joel R. Pomsett as Minister to Mexico to recover the prestige lost by delay, but his methods aroused increasing distrust and suspicion which postponed the completion of treaty negotiations and finally led to his recall, After successfully opposing the plans of Mexico to unite with Colombia for the liberation of Cuba, he negotiated a Treaty of Commerce of July 1826 and another treaty of February 1828. both of which tailed in the Mexican Congress after ratification by the American Senate. He hastily concluded a Boundary Treaty of January 1828 which was lost by delay in the Mexican Congress, but was revived in 1832 and ratified following the ratification of the new Treaty of Amity and Commerce negotiated in April 1831 by Anthony Butler, the successor to Poinsett

Meantime there arose new sources of friction which produced strained relations after 1820, temporary severance of relations in 1836 and finally (a decade later) resulted in war. In Texas, which the United States unsuccessfully attempted to purchase in 1825, 1827 and 1829, internal troubles arising from differences between the Mexican government and the American colonists, and increasing after the Mexican attempt to prolibit American immigration in 1829 and the Mexican establishment of military posts in 1831, finally resulted in a successful revolution of 1835, in which many Americans participated and also in the American recognition (in 1837) of Texan independence which, together with other grievances, aroused the hostility of Mexico. Relations temporarily severed in 1836 were again seriously threatened in 1837 by the withdrawal of the Mexican Minister who was not replaced by successor at Washington until 1842. In 1835 President Jackson, renewing proposals to Mexico for purchase of Texas, authorized negotiations for a boundary on the parallel of 37° westward from the Rio Grande to the Pacific, but in 1837 he declined Texan offers of annexation.

Relations were also endangered by American claims (against Mexico) which in 1837 brought the American government to the verge of represals by force. Attempts at adjustment were made by the Convention of 1838 which was not ratified by the American government, and by another Convention which was ratified by both parties in April 1839 and made effective by acts of Congress approved on 12 June 1840 and on 1 Sept. 1841. These claims, allowed by a commission under the Convention of 1839 and a later Convention of 1843, were only partially paid, and later negotiations for another Convention were prevented by war.

Following the American annexation of Texas by joint resolution in March 1845 (after failure of the Senate to ratify an American-Texan Treaty of Annexation), Mexico again severed relations and later refused to receive John Slidell whom President Polk sent to Mexico to re-establish relations and to negotiate for adjustment of claims and for the annexation of California which was the chief aim of his Mexican policy Finally, in the rich pasture lands of the border territory in dispute between the Rio Grande and the Nueces, the clash of rival military forces precipitated war, recognized as existing by declaration of the American Con-

gress in May 1846 Peace negotiations following the war were begun by the American government in April 1847 after important victories at Buena Vista and Vera Cruz Nicholas P Trist was sent as confidential agent with instructions similar to those of Shdell and with full powers to conclude a treaty of peace at a propitious moment. In November 1847, however, he received instruc-tions to return. Unexpectedly detained, he finally determined to remain, and without the authority of his government, he negotiated the Treaty of Guadalupe Hidalgo of 2 Feb. 1848, by which the Mexican government ceded New Mexico and Upper California for \$15,000,000 and the American assumption of all American claims against Mexico. This treaty, including all Polk's sine qua non except the right of transit over Tehnantepee (which had become less important by the recent acquisition of rights over a better route by the Treaty with New Granada), on its arrival at Washington was hastily accepted by Polk, who, although he refused to pay the salary of the "unpudent" clerk, was anxious for peace. For over a quarter-century after 1848, rela-

tions were disturbed by border turbulence, filibustering expeditions, Mexican internal troubles, questions of new claims and of protection of transit routes and apprehension of European de-

signs or of foreign intervention. In compliance with a demand for additional territory, James Gadsden concluded with Mexico a Treaty of 30 Dec 1853, by which the United States for \$10,000,000 obtained south of the Gila River a strip of territory including the Mesilla Valley, and also a right of transit across the Isthmus of Tehuantepec where conflicting interests complicated later negotiations and

relations. The Mexican problem, which thrice had been adjusted by change of boundaries, still persisted after the Gadsden Purchase. Complicated with

Southern interests, and largely under the influence of Southern statesmen, the remedy most persistently proposed for its solution, in connection with an American transit route across Mexico, was an additional reduction of Mexican territory by a new cession to the United States, or, if that should fail, the establishment of an American protectorate which was expected in time to result in new annexations to the stronger country. The problem, only partially solved by the Pierce administration, was inherited by the Buchanan administration, which continued to negotiate-first, for the acquisition of additional Mexican territory and territorial concession as long as there was any hope of success, and later for territorial concessions and alliance and direct intervention (to enforce treaty stipulations) until the secession of the Southern States pre-cipitated the beginning of the American Civil War and thereby increased the possibility and probability of the long-predicted intervention of European powers in Mexico, and exposed Mexican territory to the possible designs of Confederate filibusters.

The sequel to the story of persistent negotiations, which terminated in an unratified treaty, may be found in the Confederate policy to form an alliance with Mexico or to absorb it, the French policy of intervention in Mexico, and the American policy under Seward to prevent the execution of both Confederate and French policies and to preserve the integrity and indepen-

dence of Mexico

Through the entire period of the Civil War the American government consistently maintained cordial relations with the constitutional Juarez government. In 1861 it obtained through Mr Corwin a Treaty of Extradition of Criminals and Fugitives from Justice. To guard against the extinction of the Mexican Republic or the danger of European intervention, it authorized the negotiation of a treaty obligating the United States to pay the interest on the Mexican funded debt for five years and to take for security a mortgage or pledge on the public lands and mineral rights of northern Mexico (Lower California, Chihuahua, Sonora and Sinaloa). This plan, however, did not meet the approval of France and England and was also opposed at Washington by senators who feared it might result in annexation

Against the French invasion and occupation of Mexico and the establishment of the Maximilian government, which was regarded inimical to republic institutions in America, the govern-ment at Washington promptly protested and issued discreet warnings Later it demanded withdrawal of French forces from Mexico, resulting in the fall of Maximilian in 1867 and the restoration of the republican form of government.

The United States concluded with Mexico, in 1868, a naturalization convention regulating citizenship of emigrants and a claims commission convention for adjustment of mutual claims Under the latter a commission was duly organized at Washington 31 July 1869. Its powers were extended by convention of 19 April 1871 and again by a convention of 27 Nov. 1872 A mutual arbitration provided by the treaty gave a balance of about \$4,250,000 to American citizens. The famous Pious Fund Case (q v), first presented for adjustment to the Mexican Claims Convention in 1870, became a source of a new difference which was finally settled under a protocol of 1902 submitting it to the Permanent Court of The Hague

For a decade after the withdrawal of the French, Mexico was disturbed by domestic contentions attended with serious border lawlessness which at times impaired good relations and gave rise to troublesome questions and difficulties reaching an acute stage after November 1876, when the constitutional order of Mexico, which the United States had continually recognized for 17 years (since 1859), was overthrown by the successful military revolution of Gen Portino Díaz. The cattle raids from Tamaulipas on the Lower Rio Grande, which had caused trouble since 1848 and had become prominent in the remarkable incident known as the Cortma war in 1859 oo, but had declined during the Civil War, were renewed at the close of the campaign against Maximilian, and cul-minated in the Corpus Christi Raid of 1875 which attracted the attention of the American government to the precarious position of Amertrans along the border. These raids and depre-dations were intimately connected with the collateral question of the condition of the free zone along the Mexican side of the Rio Grande and the subject of extradition. Meantime the American government continued a temporizing neglectful policy, but, in 1875, it sent additional troops to the border and finally on 1 June 1877, authorized Federal forces to cross the border in hot pursuit.

The dangerous breach in relations of anuty was for a time widened by the delay of the American government under President Hayes to recognize the government of Díaz. Finally the American Munister (John W. Foster), who had advised against the withholding of recognition, received authority by which he promptly placed himself in official relations with the Díaz government on 11 April 1878, nearly a year after it had been recognized by the other powers. Meanwhile, in December 1877, the House of Representatives adopted resolutions looking toward a consideration of the best means of removing the existing and impending causes of difference and of confirming and enlarging commercial relations.

The friendly feeling manifested following recognition of Díaz was of brief duration Negotiations, which encountered delays, were rendered more difficult by complications resulting from new revolutions and disorders. American forces again crossed the border in hot pursuit of marauders in the spring and summer of 1878. Díaz, induced by Mexican clamor, demanded the withdrawal of the American order for crossing the border. This the administration at Washington declined to do. By October 1878 the situation threatened to result in war. Finally, with the establishment of orderly conditions by co-operative action in 1879, the American government in 1880 withdrew the order for crossing the border.

At the same time by the steady growth of centralized power in Mexico, relations had become increasingly friendly. The danger from Mexican internal disorders had largely disappeared in 1880, when Diaz retired and acquiesced in the election of his lieutenant whom he succeeded by re-election four years later. Border conditions rapidly improved. A reciprocity treaty was signed in 1882 and troublesome questions of the «free zone» and extradition were considered in a friendly spirit. A

partial rehet from the continuation of border lawlessness was sought in 1882 in the agreement (later renewed yearly for several years) providing for crossing the border by armed forces of either country in pursuit of Indians, and by a convention for the establishment of the international boundary by suitable commissions of survy.

Steady improvement in relations was also greatly aided by extension of railway communication to the frontier by 1881, and to the interior of Mexico by 1883-84, by American capital and also by connecting the telegraph systems of the two countries through the completion of a submarine cable in March 1881. The establishment and multiplication of international railway communications, revolutionizing commercial conditions, largely supplanted the need of temprocity freaties which, although negotiated in 1882 and 1391, were defeated in the American Congress.

Relations continued to improve in mutual triendliness, although public opinion in Mexico was divided between a policy of rolation and a policy of closer intercourse and concessions for industrial enterprises. In purishance of the latter policy, the Mexican government by 1889 modified the old Mexican land laws and gave to American citizens liberal trailroad, immeral and other grants.

A better understanding followed the establishment of an international water boundary commission in 1889 and the remarking of the southwestern boundary westward from FI Paso in 1891 %, as defined by the Treaty of 1848. An unsatisfactory effort was made in 1895 to remedy the abuse of the Mexican free zone by sminglers. In 1896 a copyright freaty was negotiated and in 1899 an extradition treaty (supplemented in 1902). In 1895, through the good offices of the United States, Mexico concluded with Guatemala an arbitration convention for settlement of a long standing boundary dispute. In 1900 the Mexican Congress appropriated \$30,000 for sufferers in the Galveston disaster.

The better understanding was indicated by the reference of the famous Pions Fund controversy to arbitration by The Harue Court (1902), the adjustment of boundary difficulties arising from the shifting of the Rio Grande and Colorado rivers, the negotiation of a convention (of May 1900) for the equitable distribution of the waters of the Rio Grande for irrugation purposes and the negotiation of an arbitration treaty in 1908. It was especially illustrated by the Americo Mexican co-operation in 1907 in plans factfully initiated by the United States to maintain order in Central America.

The growing intimacy of relations during the long presidency of Díaz, indicated by many international agreements, culminated in a general treaty of arbitration and the meeting of Taft and Díaz in 1910.

Relations again became strained after 1911 in connection with the collapse of the Diaz government and by conditions of the Madersta revolution, both in Mexico and along the border, which were a source of much concern to the United States.

The American government under President

The American government under President Taft, although it mobilized troops on the frontier, declined to intervene and with difficulty maintained neutrality-both before and after if recognized the new government of Madero, which was finally overthrown in February 1913 by Felix Diaz and General Huerta. In 1912 the rumor of Japanese plans to secure a har-bor at Magdalena Bay caused the Senate to pass an opposing resolution which, however, was not

accepted by President Tatt Under President Wilson's new policy of using non-recognition as a means of discouraging the establishment of governments based on locce and violence, the American government refused to recognize Huerta, unsuccessfully urged an early free election in Mexico, warned Americans to leave that country and vigorously demanded both the *de facto* government of Huerta and insurrectionists to respect lives and property of Americans. In April 1911, after a series of irritations

and insults it sought reparation by a naval and military force which occupied Vera Cruz, but, with certain restrictions, it promptly accepted Friendly mediation of the A B C powers of South America (Argentine, Brazil and Chile) which in May 1911 considered plans for settlement of the internal and external difficulties of

Mexico

Finally, after the failure of an appeal (by a Latin American conference at Washington) to the rival factions to settle their differences, the American government, on 19 Oct. 1915, 1000guzed the Carranza government as the

de facto government of Mexico

In March 1916 a new trouble arose from Villistas on the American town an attack of of Columbus, N. Mex., instigating the American government to send a punitive American force under General Pershing into Mexico in hot pursuit. Carranza protested and insisted upon withdrawal while the United States, refusing to recede from a settled determination to maintain its national right and its duty to remove the peril, called 150,000 militia to the border. The situation during a period of negotuations was complicated by a new raid of Mexican bandits into Texas. An encounter with Mexican troops, resulting in casualties on both sides and capture of 17 Americans as prisoners, threatened to produce a final crisis which was averted only by Mexican acquiescence in the American demand for immediate release of the prisoners. The strain of the situation continued until complications were solved by agreement upon a joint commission of six members, who, however, could not reach an acceptable plan of action. Early in 1917, the American government, after gradually withdrawing American troops, sent an ambassador to the Mexican government of Carranza under whose auspices preparations for better condi-ions were begun by the adoption of a new national Constitution.

Later relations were affected by conditions relating to the First World War. In February 1917 when the American government was becoming more determined in its resistance to Germany's piratical acts against American rights upon the seas, Mexico proposed to neutrals to invite the Seas, Mexico proposed to neutrals to invite the European belligerents to terminate the conflict, or, in case of failure, to reduce the conflagration by refusing any kind of implements and by suspending commercial relations. In reply the American government, declining the proposal, exposed a recently discovered plot of

the German government to induce Mexico to Join with Japan in war against United States, the bribe offered being the territory ceded to United States in 1848 Mexico denied all com-

plicity in the plot.

A crisis developed in 1926 with the United States over the Mexican petroleum and land laws United States and Great Britain took the stand that foreign investors should be protected and enjoy equal rights with Mexicans Arbitration was proposed, and President Calles indicated that, while he would arbitrate on the amount of compensation for foreign property, he could not arbitrate the question as to the right of Mexico to alter or revoke by legislation the titles to foreign-owned property. In January 1927 prominent Mexicans asserted that anti-Calles factions in Mexico would not accept any arbitration awards affecting the constitution.

When President Coolidge appointed Dwight Morrow as United States Ambassador to Mexico in 1927 it was the beginning of a Good Neighbor policy toward the Latin American republics which has continued to date President Herbert Hoover further strengthened the smcerity of the United States attitude by recalling American marines from the Caribbean area, and President Franklin D Roosevelt in 1933 dedicated the United States to the policy of the Good Neighbor in his inaugural address. This new harmony among the American nations has proceeded toward a high-water mark with very few setbacks Dwight Morrow's successors in Mexico, J. Reuben Clark and Josephus Daniels, carried on the good work of their predecessor and backed to the fullest extent the ideal of national sovereignty of each Latin American state. At the Pan American Congress, held in Buenos Aires in 1936, this ideal was officially accepted by the United States when it was resolved and approved that in the future no American state would intervene in the affairs of another «directly or indirectly, and for whatever reason.»

The only ripples on the smooth surface of Mexican-United States relations in the past 15 years or so developed in 1926–28 when Mexico backed the Nicaraguan Sandino against American investors and marines, and in 1938 when President Lázaro Cárdenas of Mexico expropriated all foreign-owned oil wells when their management refused to abide by Mexico's labor laws. About \$175,000,000 worth of these wells were owned by United States interests and about \$250,000,000 worth of them belong to British and Dutch investors. A storm of protest was raised in the United States by the oil companies, but the State Department sat tight. In 1941 an agreement was finally reached whereby the United States Export-Import Bank would lend the Mexican government funds, and Mexico would make substantial payments on properties expropriated. On 29 Jan 1942, the United States Senate ratified a treaty with Mexico providing for the adjustment and settlement of about 4,300 outstanding claims of nationals of each country against the government of the other. Under this treaty Mexico will pay the United States \$40,-000,000 over a period of years.

In the Mexican elections of 1940 feeling ran high, but when Avila Camacho defeated Almazán by odds which were so overwhelming as to appear incredible (Ávila Camacho 2,476,641 to Almazán's 151,000), Vice President Henry A. Wallace of the United States followed the Mexican established principle of recognizing any government which came to power when he went to Mexico City for the Mexican mangination

Another point of Mexican-United States 1elations during the past several years has been the silver purchasing policy of the United States government. In order to maintain the price of Silver in the United States, the federal government bought domestic silver at prices ranging from 60 cents to 71.11 cents an ounce, and loreign silver at prices ranging from 30 to 40 cents an ounce. This was of help to the Mexican mining industry and economy, for that nation produces about 40 per cent of the world's silver Late in 1911 the United States agreed to pay Mexico 35 cents an ounce for 5,000,000 ounces of silver from month to month

In 1940 when he was elected President, Avda Camacho, who belongs to the center, announced his firm support of the democratic ideal and hemispheric unity. He even went so far as to invite the investment of foreign capital in his country. When Japan and the other Axis powers declared war on the United States in December 1941, Mexico immediately severed diplomatic relations with them. The Good Neighbor policy was proved to be as effective in reciprocal deed

as it had been in word

Mexican trade with the United States has also been on a cordial basis for the past several years. About 80 per cent of her imports in the year 1911 were from the United States, and about the same percentage of her exports went to the United States (84 per cent in January 1940). Ninety-eight per cent of the tourist travel in Mexico is North American, and in 1941-150,-000 American tourists visited that country Tourist travel is rapidly becoming Mexico's number

one industry.

At the conference of Ministers of Foreign Affairs of American Republics held in Rio de Janeiro in January 1942, the Mexican Minister Ezéquiel Padilla, pethaps more than any other Latin American figure, was responsible for obtaining group support of the United States Rising to a high pitch of oratorical eloquence, Padilla pled for a new Magna Charta of «the free American,» and urged a solid bloc of American nations against the Axis powers. The delegates rose to their feet and cheered for several minutes. No speech had stirred such spontaneous enthusiasm at any Pan American gathering for many years past, and Padilla's words contributed as much as any amount of material armament of which the United States might have boasted toward the success of the conference. At the conclusion of the gathering, Under Secretary of State Sumner Welles of the United States remarked: «For the first time in the history of our hemisphere, joint action of the highest political character has been taken by all the American nations." A few days later every Latin American nation except Argentina and Chile had broken off diplomatic relations with the Axis powers, and the economic resources of the entire hemisphere were marshaled in a giant pool for the United Nations Latin American ports were opened to United States warships, airports were opened to United States planes, air-tight trade pacts assured the United Nations of all Latin America's strategic raw materials, and a period of mutual trust and cooperative effort began for the 21 American republics. Nothing like that happened in 1914-18.

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19. CULTURAL RELATIONS WITH THE UNITED STATES. During the years 1920/42 cultural relations between Mexico and the United States became closer than at any time in the history of the two nations. There were periods of considerable economic friction, but in spite of this, only the slightest cultural animosity existed, and only the most one track minded literary writers in either country belittled the other. Two rather violent episodes, however, did drag forth their quota of general denunciation from the other side of the fence. The first, Mexico's announced governmental policy of the years 1925 35, was the extreme anticlerical attitude of the Mexican revolutionary presidents. It caused Catholics in the United States to write strongly against this policy of the Mexican government, and against that government itself. The other, North American ownership of oil properties and chiele interests in Mexico, evoked a veritable stream of so-called «revolutionary dramass from the pens of Mexican writers in which the alleved hypocrisy, greed, cruelty, and materialism of United States capitalists was bitterly attacked. Juan Bustillo Oro and Mauricio Magdaleno wrote several of these dramatic tirades which were presented by the Leftist «Teatro de Ahora» in Mexico City. José Vas-concelos, a much better known writer than either of the above two, who was once Mexican Minister of Education under President Obregón, also wrote several escays with a strongly anti-United States tinge. His thesis, which was that of many Mexicans, was that United States Monroeism had become a purely unilateral policy which redounded only to the benefit of the great «Colossus of the North.» On the other side of the scales Vasconcelos placed what he called the policy of Bolivarismo, the Latin American ideal of Hispanic unity as announced by Simón Bolfvar, a unity of the Ibero American nations of the New World to oppose the materialism of the north.

But it was not long before Mexico's strongly anti-Church policy was ameliorated, and finally abandoned completely, and the Good Neighbor policy of the United States soon brought about a reversal of the Mexican attitude toward the United States Department of State as the arch «big-stick» protector of American investments. Mexican students flooded North American universities, and American students attended the summer schools of the National University of Mexico in greatly increasing numbers. Mexican artists, writers, teachers, and business men were myited to the United States. The muralists Diego Rivera and José Clemente Orozco spent many years in the United States where they gave many lectures and painted some of their finest Municipal buildings, public centers, and works. Municipal buildings, public centers, and many United States colleges were decorated with their highly pictorial and colorful frescoes. One of Rivera's murals was destroyed at Rocketeller Center in New York because of its «communistic" note, but all other works of these two masters were enthusiastically received, and mural art in the United States underwent an almost complete rebirth after its intimate contact with them

The Committee on Cultural Relations with Latm America in 1925 established an annual seminar of inter-American studies to be held in Mexico. Many outstanding Mexican teachers and writers took part in this program of advanced studies, and some of the finer essays produced in connection with these study groups were published in books which soon became the recognized authorities in matters of Mexican art, music, folk dances, economics, finance, literature, politics, and sociology. Illubert C. Herring, one of the world's outstanding Latin American scholars, served as editor of these groups of

essays.

Another medium for the propagation of Mexican culture in all its phases in the United States is the excellent magazine Mexican Life, founded in 1924 by Howard S. Phillips Mexican Life is published in Mexico but is written entirely in English, and some of the best available articles on Mexican culture have appeared in its pages. This journal also contains frequent reproductions of works of Mexican art, and many fine

photographs.

In the purely literary field relations between the two countries were also greatly intensified. Besides the scholarly studies on Mexico by Ernest Giuening, Robert Redfield, Carleton Beals, Stuart Chase, Hubert Herring, and a host of other North Americans, many works on the United States were widely read in Mexico, and among the literary figures of the United States, Pearl Buck, Eugene O'Neill, Sinclair Lewis, John Steinbeck, John Dos Passos, Thornton Wilder, and a great many others appeared in excellent Spanish translations so that it was not long before they were almost as well known from Mexico to Argentina as they were in the United States.

Translations in English of works of Mexican literature have appeared in equally great numbers during the past few years. The famous poet Amado Nervo appears in several English versions, and Alice Stone Blackwell, G Dundas Craig, and E. W Underwood have made many other Mexican poets known in English translations Among the novelists, Mariano Azuela, author of the famous 'Underdogs' or 'Los de

abajo, has brought the Mexican Revolution graphically before the North American public. The English version of the 'Underdogs' appeared in 1929 and was illustrated with several fine drawings by José Clemente Orozco. 'Marcela,' another of Azuela's novels, which treats of the Diaz tyranny which was rampant just before the outbreak of the revolution, appeared in English in 1932. A third novel of the Mexican Revolution, 'The Eagle and the Serpent' by Martín Luis Guzmán, preceded it by two years. The Mexican prize novel, 'El india', of Gregorio López y Fuentes, came out in 1935 beautifully illustrated by Diego Rivera. Whereas Azuela and Guzmán had presented rather disconnected verbal «etchings in blood-acid» of the chaotic revolutionary years, and the cruel, blind swirl of the thwarted dispossessed lashing out in all directions and against all authority. López y Fuentes presents a symbolic and pathetic picture of Indian life in an isolated Mexican community. No proper name occurs in the novel, each person is a type, each incident is a symbol. The Indian boy crippled by greedy whites who invade his village in search of gold becomes a symbol of crippled Mexico whose bones have been crushed by white and mestizo greed driving the very life-blood from the exploited natives. A Mexican novel appearing in English in 1941 was the prize novel 'Nayar' by the well-known poet Miguel Angel Menéndez. 'Nayar' presents the story of a mestizo who murders a local judge and has to flee his town to wander over Mexican swamps, jungles, mountains, and through many little villages until he finally takes up with an Indian community whose primitive spirit of justice he greatly admires Nevertheless, his mestizo Spanish tutoring causes a deep cleavage in his feelings of loyalty, and when the Indians are about to kill a so-called sorcerer for having blighted their crops, the mestizo protagonist be-trays them and brings in the federal police. (Nayar,) thus, represents the conflict between two Mexican civilizations, one dying, or at least being absorbed, and the other achieving a dubious victory by way of organization and dominance. Two more famous works of Mexican literature, appearing in 1942, were the 'Periquillo Sarniento,' of Fernández y Lizardi, first Latin American novel, and a colorful picture of Mexican on the verge of its struggle for independence. ico on the verge of its struggle for independence against Spain, and the famous 'History of Mexican Literature) by Carlos González Peña.

In the musical field, too, Mexico has recently come to the fore in the United States Carlos Chávez, director of the National Mexican Orchestra, in 1936-37 directed both the Boston and New York Philharmonic Symphony Orchestras in special invitation, and his symphonic pieces are now rather frequently played in the United States. Several of his excellent articles on music, particularly on Mexican music both ancient and modern, have been widely circulated in English translation Chávez was enabled to carry on some of his purely artistic work as a composer and musicologist with the award of a North American Guggenheim Fellowship.

Another element which has contributed much to the growth of closer cultural relations between Mexico and the United States is the International Institute of Ibero-American Literature organized in Mexico City in 1938. The National University of Mexico foresaw the fundamental necessity of closer spiritual ties between the

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Hispanic and the Nordic sectors of the hemisphere, and took the initiative in organizing this institute of literature. In 1940 the institute succeeded in obtaining invitations for several Latin American professors to give courses in the United States, and among these were some of the finest scholars of Mexico. The institute publishes the largest journal in the Latin American cultural field, the Received Iberoamericania. This journal dedicated to the propagation of hemispheric culture is published in Mexico City, and is widely read throughout the Americas.

In the field of the motion picture, Hollywood and Mexico have frequently vied with each other in the production of fine films on the Mexican scene, and of course the majority of the motion pictures shown in Mexico are Hollywood products. A North American attempt to present the life of the revolutionary bandit Pancho Villa in (Viva Villa) did not take so well in Mexico, but Juárez? which portrayed that pure-Indian President as the Mexican Abraham Lincoln was very well received. In the meantime, Mexico sent many fine films to the United States. The famous Russian motion picture photographer Eisenstein traveled over that country for many months until he had amassed 150,000 feet of film (feature length: 8,000 feet) on nearly all phases of Mexican life. The finest shots of this collection were released under the title Thunder Over Mexico,' and for pure pictorial effect they have never been equaled. A revision (1940) of this film called 'Time in the Sun' was made by Marie Seton, a British cinema critic. The Paul Strand film 'Las tedes' (called in English 'The Waves'), was another supreme example of fine motion picture photography Music for this picture was composed by the outstanding Mexican musician Silvestre Revueltas, and added greatly to the effect of the whole. The fact that these two pictures had a rather marked Leftist emphasis prevented their being received on the basis of their artistic merits alone which were certainly of the highest possible caliber. Other Mexican films which have been rather widely shown in the United States are 'La ciudad de los mayas' ('The City of the Mayas') which depicts native life on the peninsula of Yucatan, and 'The Forester Village, based on a great by Letter Village. gotten Village, based on a story by John Steinbeck who also helped to direct the picture. The untrained native actors of this film, and superb technical direction achieve a fusion which brings a new sincerity to the screen. It is through this medium of the cinema and other expressions of Mexican culture that people in the United States may come truly to know and understand the great nation across its southern frontier.

For further information on Mexican literature, art, music, and leading personalities, see under Latin America; Latin American Cultural, Social, and Political Figures.

TURAL, SOCIAL, AND POLITICAL FIGURES.

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University of California, I os Alngeles, MEXICO, a state of the United States of Mexico, in the southeast; bounded by the state of Hidalpo on the north, on the east by Tlax-cala and Puebla, on the south by Morelos and Guerrero, and on the west by Michoacan and Queretaro. Adjoining the state of Morelos is the federal district enclosed by the state of Mexico but outside of its jurisdiction. The area of the state of Mexico is 9.247 square miles and its population about 1,000,000. The capital is Toluca. Several railroads traverse the state and center in Mexico City.

MEXICO, Mo., city, county-seat of Audrain County, on Salt River and on the Wabash, the Chicago and Alton and Chicago, Burlington and Quincy railroads; about 115 miles northwest of Saint Louis. Mexico was settled in 1833 and in 1852 was incorporated. It is in an aggicultural section, the chief products of which are wheat and corn. The manufactures are dressed marble, flour, shoes, cigars, stove lining, frebrick products. Mexico is the center of the saddle-horse producing section of the West. It leads also in mules and livestock and has recently completed 18 miles of electric railway north to Santa Fé, Mo. Corn, wheat and blue grass are principal products. Mexico is the seat of the Missouri Military Academy and of the Hardin College for Women, founded in 1873. The charter under which the government is administered was granted in 1803, and provided for a mayor who holds office two years, and a council. Pop. (1930) 8,290; (1940) 9,053.

MEXICO, City of, capital of the Republic of Mexico and the finest city in Latin North America, is situated in lat 19° 26′ 5″ N, long 99° 6′ 45″ W from Greenwich, at an altitude of 7,434 feet above the level of the sea, near the centre of the Valley of Mexico and in the political subdivision of the republic known as the Federal District. The climate of the city is mild. The temperature ranges from 35 degrees to 90 degrees Fahrenheit, but it seldom talls below 60 degrees or rises above 80 degrees, the mean being between 60 degrees and 70 degrees. The nights and mornings are cool throughout the year, the hottest months being April and May Pop (1940) including suburbs 1,749,916

Topography and Streets.-At the beginning of the 19th century it was the largest city in the Western Hemisphere Humboldt then called it "the handsomest capital in America" Today it is one of the handsomest and wealthiest cities in the world. It is the political the commercial, the educational centre of the Republic, indeed, the centre of every line of national activity. It is distant by rail from: Vera Cruz, on the Gulf of Mexico, 263 miles; Acapulco, on the Pacific, 290 miles; El Paso, Texas, 1,224 miles and 839 miles from Laredo, Texas. Its streets, of which, with lanes, there are 3,200, are straight, extending from north to south, and east to west and intersecting at right angles, except in the newer districts and suburbs where there are some diagonal avenues. The newer portions of the city are chiefly to the southwest. The principal streets are broad, well paved with asphalt, well kept, bordered with good sidewalks, and are electrically lighted Many of the streets in the older parts of the city are narrow. The street nomenclature was formerly peculiar, a continuous line of street often having a different name at every block. In 1889 the streets were renamed. All extending east and west were named avenidas (avenues); all north and south calles (streets), one name being given to a continuous thoroughfare. But the people, especially the uneducated classes, clung so tenaciously to the old names that the authorities yielded and the former names were restored. However, readjustments made in 1908, 1909 and 1916-21 have in great part remedied the confusion. There is no exclusively residential section, one of the handsomest residences often being found between two business houses in the heart of the city. The principal business street is the Avenida Francisco I Madero (the quondam Avenida San Francisco). It is the most fashionable shopping street and is reminiscent of similar centres in the great capitals of l'iurope. The Avenida Cinco de Mayo, like the Avenida Francisco I Madero, starts from the main square, the Plaza Mayor. It is also an important business thoroughfare. Other streets have religious names, taken from the names of churches situated thereon. Still others have very odd names, as Lost Child, Sorrow, Sad Indian. The electric street-car system, starting from the Plaza Mayor, reaches all parts of the city and connects all the suburban towns. The city and connects all the suburban towns.

new Pan American Highway leads directly into the city, and is paved to the U.S. border.

Parks and Public Buildings.—The principal square is the Plaza Mayor or Plaza de la Constitucion, or Zocalo, situated in the center of

the city. It covers 14 acres, but is only part of the ground enclosed by the walls of the teocalli (main temple) of the ancient Aztec city. The entire eastern side of the plaza is bounded by the National Palace, which is said to occupy the site of Moctezuma's new palace. The present building was begun in 1692 and has been added to from time to time till now it has a frontage of 675 feet. It is two stories high and architecturally the least attractive public building in the city, being long, low and monotonously plain. Originally it was the residence of the Spanish rulers of Mexico, but for many years has been devoted to housing some of the executive departments of the national government, including the President's offices On the second floor is the Hall of Ambassadors, with its walls hung with portraits of Mexican rulers since independence was won, besides a full-length likeness of Washington. Over the main entrance hangs the Liberty Bell, with which, in his church at Dolores, the father of Mexican independence, the priest Hidalgo, called his people to arms on the night of 15 Sept. 1810. It was moved to its present location in 1896, and since, a feature of every celebration of the anniversary of independence is the ringing of this bell at midnight by the President. On the north side of the Plaza Mayor is the cathedral, the city's chief architectural feature, its most majestic, most imposing edifice. It occupies a part of the ground enclosed by the walls of the ancient Aztec temple. It covers a greater area than any other church in the Western Hemisphere, and is surpassed in this respect by only two in the whole world—Saint Peter's at Rome and the Spanish cathedral at Seville. The walls are gray stone. From the sides of the façade rise two bell towers 204 feet in height. The whole pile is crowned by a central tower which commands a superb view of the city and the sur-rounding valley. The corner stone was laid in 1573; the walls were finished in 1615, and the roof completed in 1623, when the first Mass was said. It was dedicated in 1667 but was not entirely finished until 1791. It occupies an extent of 374 by 187 feet and is of composite architecture, blending the Corinthian, Doric and Ionic. Altogether, both outside and in, it has cost many millions. The railing of the choir is made of a composite of gold, silver and copper and is said to have cost \$1,500,000 The interior contains also some exquisite wood carving and some excellent paintings, the best being one by Murillo, in the chapter-house. In this cathedral in 1822 Agustin Iturbide was crowned emperor of Mexico, and here he is buried, his coffin bearing simply these words: "The Liberator" Here, too, in 1864 the Austrian Archduke Maximilian and his wife, Carlotta, were crowned emperor and empress of Mexico. Other churches especially noteworthy are La Profesa, one of the most beautiful; Santo Domingo, one of the largest; San Hipolito, and San Francisco, the most interesting historically. In the last-named edifice Cortes worshipped and for many years lay buried. Here Iturbide attended the celelay buried bration of Mexican independence and here was held his funeral.

Adjoining the National Palace on the north is the National Museum, containing a large and very valuable collection of Mexican antiquities, as well as many treasures identified with the

nation's history from the earliest down to recent times. Some of the most valuable archæological remains have been found a few feet below the surface while excavating within the grounds which were once enclosed by the walls of the Aztec temple. The most important of these treasures are the Sacrificial Stone, the Aztec Idol of War and Death, and the Stone of the Sun. The last is often erroneously called the Calendar Stone Besides these there is an almost endless array of small stone specimens, as well as tools, arms, weapons, picture-writing and feather-work. In the section of national history is the banner borne by Hidalgo during his struggle for the independence of the colony, the standard belonging to Cortes, and carried through the period of the Conquest, and Maximilian's silver table-service and coach of state. Here also are located the National Observatory and Bureau of Meteorology.

Near the National Palace is the National Academy and School of the Fine Arts, founded in 1778. It contains paintings ascubed to Murillo, Rubens, Velasquez, Leonardo, but its most interesting work, the one pronounced by distinguished art critics one of the great paintings of the world, represents the Spanish priest and historian, Las Casas, protecting the Aztecs. It is the work of Felix Paria, a native artist, and received the first prize in the Academy of Rome The Academy receives an annual allowance from the government, a large part of which

is spent in prizes.

The National Library is housed in a fine building, once the church of Saint Augustine, which, like other religious foundations, in 1859 when the Laws of Reform took effect, became the property of the state. Portrait busts of distinguished Mexicans ornament the fence enclosing the gardens at the sides. Along the walls of the interior are ranged statues of the greatest men in literature of all times and places. The library contains more than 500,000 volumes. When the monasteries were suppressed, their libraries were gathered here and the collection therefore is especially rich in ecclesiastical literature. In 1537, the first book printed in the New World was printed in the City of Mexico on a printing-press brought from Spain. Its title: Escala Espiritual para llegar al Cielo.' No copy of this work remains, the oldest work extant being a history of Tenochtitlan (Mexico) published in 1543. In this city was printed the first music printed in the New World, the first engravings from wood, the first newspaper, Mercurio Volante (Flying Mercury), and antedating the first paper in the American colonies by more than 10 years. Besides the National there are several small libraries with collections ranging in size from 7,000 to 14,000 volumes. The national archives are stored in the National Palace. The new Post Office Building was completed in 1907. It is a noteworthy structure in the Plateresque style and cost about \$3,000,000. Other noteworthy structures are the School of Medicine, the School of Mines, the School of Engineering, the General Hospital, the Hotel Iturbide, the buildings of the National Geological Institute, the Normal School, the Department of Communication and Public Works, Department of Foreign Affairs, and the Palacio Municipal, the last named on the south side of the Plaza Mayor and housing the offices of the city and the Federal District.

One of the largest and most beautiful parks and public gardens is the Alameda, situated about half a mile west of the Plaza Mayor, and bounded on the south by the Avenida Juaiez. It covers about 40 acres which include the lot wherein the victims of the Inquisition were It is intersected by pleasant walks, shaded by fine trees, adorned with flower beds, flowering shrubs and fountains. Concerts, attended by all classes, are given here every Sunday afternoon. A very short distance from the Alameda, Avenida Juarez opens into the Pasco de la Reforma, one of the most beautiful avenues in the world. It was designed by Maximilian, who named it the Boulevarde Imperiale. It is the fashionable afternoon drive and promenade It is over two miles long and is lined on each side by double rows of trees, beneath which are foot-ways and at their side; stone benches Starting at the equestrian statue of Charles IV of Spain, it expands at regular intervals into glorietas (circular park expansions), some of which are adorned with monuments of the greatest men in Mexican history. This statue of Charles IV is one of the city's finest works of art. It was made in Mexico at the beginning of the 19th century by Manuel Tolsa, it being the first important piece of bronze cast in America. At another circle is a statue of Columbus, and still further on one of Cuauhtemoo, the last of the Aztec emperors

The Pasco extends to the gates of Chapultepec, a rocky height roung abruptly from the level of the surrounding plain. A beautiful park, set with gigantic cypresses, which antedate the Spanish Conquest, encucles the base of the rock. A palace crowns the hill, a part of which is occupied as the official home of the President. Back of the hill is the battlefield of Molino del Rey. The view from the front is regarded as one of the most beautiful in the whole world,-the long vista of the Pasco to the city, standing in the centre of the valley, encircled by high mountains from which rise the snow capped peaks, Istaccilinati and Popocatepeti, 16,000 and 17,782 feet respectively above the level of the sea. In the park at the base of the rock there is a monument to the Mexican cadets who fell in 1847 while defending the hill from the assault

of the United States army.

Suburbs. - The chief suburbs are: Tacubaya, San Angel, Coyoacan, Popotla, Guadalupe and the towns along the line of the Viga Canal All are within a radius of eight miles of the centre of the city. The Viga Canal is about eight miles long and connects the city with lakes Xochimilco and Chalco. From the gardens along this waterway come the flat-bottomed boats loaded with vegetables, fruits and flowers for the city market. Toward the headwaters of the canal are the Chinampas (so-called floating gardens). That they once floated is certain, but they are stationary now and are mere patches of ground intersected by narrow channels, and used as market gardens. At Iztacalco are other floating gardens. A road, the Pasco de la Viga, borders one side of the canal. Guadalupe Hidalgo, two miles north of the capital, contains the celebrated shrine of the Virgin of Guadalupe, the patron saint of Mexico. Here the treaty of peace, following the war of 1847 with the United States, was signed. At Popolla is the famous tree, El Arbol de la Noche Triste (Tree of the Dismal Night), beneath which Cortes is said

to have sat and wept on the night of 1 July 1520, after his expulsion from the city Coyoa-can is even older than the City of Mexico Cortes made it the seat of government while he superintended the rebuilding of the conquered The house in which he lived is still standing San Angel is a beautiful little town, well known, too, for its excellent fruits, flowers and vegetables. At Tacubaya is a national astrononucal observatory. The town contains many palatial homes.

Public Works.—The city is situated at nearly the lowest point in the valley, and from the earliest times had always been in danger of There are six lakes (so called) within the valley, all of which, with the exception of Texcoco, are above the level of the city. In times of heavy rains their waters sometimes overflowed the banks and, having no outlet through the surrounding mountains, found their way to Lake Texcoco which, being only two or three feet below the level of the city, rose sufficiently to flood it Before the Spanish Conquest and for some time afterward dikes were built about the city to keep the flood waters out, but these proved ineffective. dations occurred on an average once in 25 years. In 1608 the Cut of Nochistongo was made through the mountains, as an outlet for the flood waters of the highest lake in the valley which is 13 feet above the level of the city But this work only partly relieved the situation. In 1629 there was another flood and the city was submerged to a depth of three feet for five years This paralyzed business and caused great loss of life and property. The Spanish government ordered that the city be abandoned and another site be chosen on higher ground But presently, owing to a very dry season and to earthquakes, the waters passed away and the royal order was not carried out. Not till 1789 was the city freed from the menace of deluges, but the menace of malaria and epidemics remained In 1885 the gigantic canal and tunnel project was jointly undertaken by the city and national government. It was designed to serve a two-fold purpose: to control the waters of Lake Texcoco, thus removing all possibility of future mundations; to be a continuation of the city's sewerage system It starts just east of the city, where it joins the net work of city sewers. It extends to the mountains, a distance of 43 miles, connecting with Lake Texcoco, on its way. It pierces the mountains by a tunnel seven miles long, and beyond the mountains is continued as a canal for several miles, finally emptying into a river which carries the city waste to the Gulf This gigantic undertaking was completed in 1903 and ranks among the truly great enterprises of modern engineering. The city can never again be inun-dated and it is now provided with an effective sewerage system of which from the very beginning of its existence it had been in the greatest need. The water supply is taken mainly from the western mountains and from several natural springs at the foothills to the south of the city. The latter supply is now largely used as potable water Several aqueducts bring it to the city.

Commerce and Industry.—The city is the commercial, financial and industrial centre of the Republic. It possesses several wealthy banking institutions, the largest being the National Bank of Mexico. There are hundreds of industrial es-

tablishments, most of which have sprung up in recent years with the advent of electric power Textiles, cigarettes, cigars, hats, furniture, glass, pottery, rope, wire, starch, glue, soap, musical instruments, leather, boots and shoes, ice, alcohol, beer, flour, paper, etc, are manufactured. The trade interests are largely in the hands of foreigners, mostly Germans, Frenchmen, Englishmen and Americans There are several public markets. There are also hundreds of licensed shops for the sale of wines, liquors, beers and pulque. The trade of the capital as the whole sale centre of the Republic is facilitated by a number of lines of railway, which radiate to all quarters and link up all important centres

Municipal Administration.— The Palacio Municipal (city hall) is situated at the south side of the Plaza Mayor The present building dates from 1720 In its council chamber are portraits of all the governors of Mexico from Cortes The latter established the municipal cor-poration of Mexico in 1522 Its officers were two alcaldes (judges), four regidores (councilmen), an attorney and a notary. Thereafter, for nearly 400 years, till 1903, the city government was vested in a city council, composed of aldermen, a mayor and a governor of the Federal District. From 1903, the Federal District, of which the City of Mexico is the chief city, has been governed similarly to the District of Columbia, United States. The powers of government and administration are lodged with three federally appointed officials, namely, the governor of the district, the president of the Superior Board of Health, and the director of public works Besides the special powers belonging to each of these officials, the three act together as one superior governing body known as the Superior Council. The city continues to elect a board of aldermen, but its powers now are restricted to those of advice, supervision and veto. The board may suggest measures to the three district commissioners for the benefit of its constituents; it may see that measures adopted are properly carried out; it may suspend public works by a veto, which veto can be annulled only by the President of Mexico, acting by the advice of his cabinet. The municipal revenues are derived from taxes on liquor, vehicles, theatres, water supply, slaughter houses and other commercial establishments. The revenues aggregate approximately \$7,000,-000 yearly.

Public Health .- The death rate has always been very high, sometimes reaching 50 per 1,000. This high rate has been owing: partly to the great infant mortality among the very poor, especially the peon class; partly to very defective drainage. With the completion of the modern sewerage and drainage system, conditions began

to show great improvement.

Education.—The capital is the seat of the National University. There are several professional schools and a great number of private pay schools Education has recently been extended to the masses through a good system of primary schools.

Charities.—There are a great many charitable institutions. Of these more than 20 are hospitals, the oldest being that of Jesus Nazareno, founded by Cortes Besides these public hospitals, there are also several private ones, maintained by voluntary contributions. There maintained by voluntary contributions. are also asylums for the poor, insane, blind and

toundlings. A unique and very remarkable benefaction is the Monte de Piedad (Mountain of pawnshop Mercy), the national founded in 1774, by a wealthy name owner for the sole purpose of lending to the poor, on pledges, sums of money, at very low rates of mterest, thus protecting them from the extortionate charges of private pawnbrokers. After a certain length of time the unredeemed pledges are sold, and when all expenses are paid the balance in each case is returned to the original owner

History.—Of what often passes for the history of the city before the Spanish Conquest, and indeed, for many years after, it would be hard to tell how much is true, and how much false. But there is no doubt that it was founded by the Aztecs. It is generally accepted as true that they came from some unknown region in the Northwest, perhaps north of the Gulf of California, that for more than 100 years they wandered in the Mexican Valley, that they settled near the centre of the valley on islands of Lake Texcoco, in the early part of the 14th century. Tradition says they were directed by the oracle to settle where they had seen, perched on a cactus, an eagle devouring a snake. Hence the centre of the national coat-of-arms. The original name of the city was Tenochtitlan.

In the centre was the great teocalli (temple). The first rude houses, standing on piles and built of mud and rushes, before the Spanish Conquest had been replaced by buildings of The city had a radius of over a mile; and area of about one-twentieth that of the present city. It was intersected by canals; hence sometimes called the Venice of the Western World With the mainland it was connected by cause-ways. During the Spanish Conquest (1519-21) the Aztec city was partially destroyed trustworthy record exists as to the size of the population at this time. One contemporary writer states that it was 500,000; another, 30,000. On the same site in 1522 Cortes began the building of the Spanish city. But so many changes have been made since then that the city of today retains hardly a trace of the city founded by Cortes. In 1600 its population consisted of 7,000 Spaniards and 8,000 Indians. In 1746 it had a population of 90,000; 50 years later one of 113,000.

For nearly 300 years it was the capital city of New Spain. Some of the viceroys were good men and able rulers and among other good deeds did much to improve the condition of the city. Events, not already mentioned, especially noteworthy in the life of the city, were: The riot of 1092, provoked by famine, and causing the loss of more than \$3,000,000 worth of property; the capture of the city by Agustin Iturbide and his triumphal entry 27 Sept. 1821, the date which marks the end of Spanish power in Mexico; Iturbide's election as emperor, 22 May 1822; the capture of the city in 1847 by the Americans under General Scott; the taking effect in 1857 of the Laws of Reform, and the consequent suppression of convents and monasteries, and the confiscation of church property; the capture of the city by the French, 9 June 1863; its capture 21 June 1867 by the Liberal army led by General Diaz; the return to the city nearly a month later of President Juarez. During the Diaz régime from 1884 to 1910 the city had a period

of uninterrupted peace. Street rioting occurred during Madero's administration and in February 1913 the city was the battleground of the tollowers of Madero and the Revolutionists under Belix Diaz and Bernardo Reyes For 10 days preceding the fall of Madero public buildmgs were bombarded and street fighting occurred. In August 1914 the Constitutionalists occupied the city and in the months following it was held by Carranza, Zapata, Villa, and Carranza a second time. Since 1930 several noteworthy public buildings and landmarks have been constructed in Mexico City. These include the Palace of Isine Arts, a beautiful marble edifice begun in 1900 and completed in 1931 at a cost of over 30,000,000 peros; the Supreme Court Building, decorated with Orozeo murals; and the imposing Arch of the Revolution, erected as a monument to that ereat social struggle. The entrance of the International Highway to the city is beautifully adorned with much fine statuary. There are also in the city several modernistic apartment houses, hotels, and private homes vyme with the most lavish buildings of this class in the United States. Murals by Diego Rivera may be found in several buildings m Mexico City, notably in the National Palace. the Ministry of Health, the Hotel Reforma, and

m the Palace of Cortes in Cuernavaca Bibliography - Ballon, 'Aztec Land'; Curtis, 'The Capitals of Spanish America', Galindo w Valla, J., 'Candad de México' (Mexico 1906); Janvier, 'The Mexican Guide'; Ober, 'Travels in Mexico'; Percival, O., 'Mexico City' (Chi-cago 1901), Prescott, 'Conquest of Mexico'; Chase, Stuart, 'Mexico' (New York 1935); Parkes, H. B., 'A History of Mexico' (Boston 1998)

MEXICO, Federal District of, a territory set apart for the exclusive use of the Central Government of the Republic of Mexico in the same manner that the Destrict of Columbia was set apart for the exclusive use of the Central Government of the United States and for the same reason, namely, so that the actions of the Federal Government might not, in any way, be hampered by state interference. It is bounded north, east and west by the state of Mexico, out of which it was carved, and south, by the state of Morelos; area, 529 sq. m.; pop. (1940) 1,749,916. The district (Pistrito Federal) was created by a law of 18 Nov. 1824. Rules for its administration were enacted 6 May 1861 and amended 14 Dec. 1900. Its present political and administrative status was fixed by the organic law of 26 March 1903 and the new constitution which was promulgated 5 Feb. 1917. Originally the district was divided into one urban municipality and four rural prefectures, but under the law of 26 March 1903 it was partitioned, for administrative purposes, into 13 municipalities, of which the City of Mexico is by far the largest and most important. The other municipalities are Guadalupe-Hidalgo, Atzcapotzalco, Tacuba, Tacubaya, Mixcoac, Cuajimalpa, San Angel, Coyoacan, Tlalpam, Xochimileo, Milpa Alta and Ixtapalapa. The local affairs of the district are administered by a Superior Governing Council, consisting of three officers - the governor of the Federal District, the president of the Superior Board of Health and the director-general of public works - all appointed by the President of

the Republic, and each of whom must be a citizen of Mexico, over 25 years of age, and not an ecclesiastic. Speaking generally, each of the three officials is independent and alone responsible in his own department. This responsibility is limited, however, by the right of the Superior Council - that is, the three officials acting together -- to revise, confirm, reform or revoke the rulings of any one of the three members of the council whenever such rulings are called into question The other duties of the Superior Council are merely advisory. It may propose changes in the district laws or administration rules for the government and organization of officers and public services; it may suggest improvements in works of public util ty, such as water supply, drainage, sanitation, the opening or widening of streets, or the creation of special commissions to study and report upon such mat-It also has general supervision over the making of contracts for public works, but all such contracts must be submitted to the higher While each of the above mentioned authority officials is the head of his own department and is responsible for the activities thereof, subordinate officers and employes are appointed by the Federal Executive The governor of the Federal District is the chief political authority thereof. He makes public and enforces all laws, rules and decrees emanating from higher authority, has charge of the police and fire departments, imposes penalties for violations of ordinances, su-pervises penal establishments, civic festivities, public diversions, plays, the sale of intoxicating liquors, hotels and restaurants, street cars, cabs, the civil register and the inspection of weights and measures. The director general of public works has supervision over the water supply, streets and roads, parks, monuments, municipal lighting, drainage and street cleaning, public buildings not under direct federal control, cemeteries; construction, repair and maintenance of slaughter-houses and markets, inspection of building operations, and over woods, lands, commons and other communal property. The president of the Superior Board of Health exercises supervision over all sanitary works, as provided by the Sanitary Code, and, in addition, directs general sanitary inspection, especially of slaughter-houses, markets, meats from other sections and cemeteries A certain measure of popular government is vested in the ayuntamientos, or town councils, the members of which are elected by popular vote for terms of four years. Each of the 13 municipalities in which the district is divided has its own ayuntamiento. To be a member of one of these councils, one must be a citizen of Mexico, resident within the municipality, in full enjoyment of civic and political liberty, more than 25 years of age, and not an ecclesiastic. The ayuntamiento of the City of Mexico is composed of 21 members, that of Tacubaya of 11 members and those of the other 11 municipalities of seven members each. Each ayuntamiento elects from its membership a president and vice-president who hold office for two years. The law directs that the ayuntamiento of the interested municipality shall be consulted by the Ministry of the Interior, the governor of the district, the director-general of public works and the president of the Superior Board of Health, as the case may be, upon matters of general importance in the municipality such as water supply, local sanitary work, estab-

lishment of new settlements and the exploitation of woods, lands and commons. The ayuntamiento must be consulted also with respect to all contracts relating to the execution of any work in connection with any of the above mentioned subjects and as to all other contracts of a municipal character having a duration of five years or more, or which call for a total expenditure of 100,000 pesos or more, or an annual expenditure of 25,000 pesos or more. In all of these matters, the ayuntamientos have, by a twothirds vote, the right of veto. The effect of this veto, when exercised, is to suspend for four months the project or contract in question. At the end of the four month's period, if the ayuntamiento still opposes the proposition by a vote of three-fourths of its members, the matter is submitted to the President of the Republic for final solution. The City of Mexico (q v), capital of the Republic, is the capital also of the Federal District While the government of the district is copied after and, in many respects, is similar to the government of the District of Columbia, its citizens, unlike the citizens of the District of Columbia, are not disfranchised They elect not only the members of the ayuntamientos but elect also, as does each of the states of the Republic, two federal senators and one member of the Federal House of Representatives for each 60,000 population or fraction thereof in excess of 20,000. The Federal District is the most thickly populated section of Mexico, having an average of approximately 1,660 inhabitants to the square mile. See, also, Mexico, City of.

MEXICO, Gulf of, an arm of the Atlantic Ocean, bounded on the north by the United States and on the south and west by Mexico It is oval in form; its greatest length is, from east to west, about 1,100 miles; from north to south, about 800 miles; area about 700,000 square miles. It has a continuous coast-line of about 3,000 miles. Its maximum depth is about 12,715 feet, and within the basin, exclusive of the submerged coastal plain, the average depth is about 9,000 feet. In former ages the area of the gulf was much greater than at present; it included the lower basin of the Mississippi, Florida, a large part of eastern and southeastern Mexico, and the basins of the northern rivers of South America. The outlet of the Gulf is on the east, between the peninsulas of Yucatan and Florida, a distance of 450 miles. At this outlet is the island of Cuba, which is separated from Florida by the Strait of Florida, 125 miles wide, and from Yucatan by the Yucatan Channel, 120 miles wide. The Yucatan Channel opens into the Caribbean Sea and the Florida Strait enters the Atlantic

The temperature of the gulf is from eight degrees to nine degrees higher than in the Atlantic in the same latitude. The temperature at the point of greatest depth is 39½°, or the same as the temperature at the greatest depth of the Yucatan Channel, although the maximum depth of the gulf is about 5,943 feet more than that of the channel. The chief current is the Gulf Stream (see Ocean Current) which enters the gulf through the Yucatan Channel, circles the interior and passes out through Florida Strait. The winds are about as on other parts of the globe where north-equatorial conditions exist; the prevailing winds from the north blow from September to March, and from the south from

March to September. The severe gales are in the winter. The northern part of the gulf, from Mexico to Florida, is really a coastal plain averaging from 40 to 100 miles wide. The basin off the Mexican coast sinks rapidly to the submarine plain, and a short distance from shore reaches the maximum depth. The Bay of Campeachy is the largest indentation. Other bays are Havana, on the coast of Cuba, Pensacola, Tampa, Mobile and Galveston, on the United States coast, and Veru Cruz on the coast of Mexico. A number of small bays and lagoons are on the western coast. The principal islands are at the entrance of the gulf; Cuba the largest, and north of Cuba, the Florida Keys, a group of coral islands. There are a number of small islands in the southeastern part of the gulf, off

the coast of Yucatan, and some in the Bay of Campeachy. The delta of the Mississippi consists of low, marshy islands. The principal rivers which flow into the gulf are the Mississippi, the Colorado, Brazos, Sabine, Mobile and the Appalachicola from the United States, the Rio Grande on the boundary between the United States and Mexico, the Rio Verde, and several short streams from Mexico. The chief cities on the coast are Havana, Florida Keys, Tampa, Mobile, Galveston and Vera Cruz. New Orleans and Houston have direct ship communication with the gulf, and Mexico City uses Vera Cruz as its port.

MEXICO CITY CONFERENCE. See Pacts and Conferences: World War II.

